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SEPTEMBER

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OCEAN LANDING FIELDS of ARTIFICIAL ICE.. Page 33

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"SAY HELLO TO DAD"



HE MAY be downtown at the office or a hundred miles away . . . yet that happy, eager voice wings across the wires, straight into his heart. It summons up a sudden, tender warmth. It sweeps away cares and worries. It brings sure, comforting knowledge that all is well at home.

Only a small voice, speaking into a telephone. But it can create a moment that colors the whole day.

If you stop to reflect, you will realize how immeasurably the telephone contributes to your family's happiness and welfare. It is a fleet courier . . . bearing messages of love, of friendship. A priceless helper . . . ready to aid in the

task of running a household. A vigilant guardian . . . always at hand when emergencies arise.

Security, convenience, contact with all the world—these things the telephone brings to your home. You cannot measure their value in money. You cannot determine the ultimate worth of telephone service.

But consider, for a moment, that your telephone is one of a country-wide system of nineteen million others—a system of many million miles of wire served by hundreds of thousands of employees. Yet you pay only a few cents a day for residential use. And you enjoy the most nearly limitless service the world affords.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY



I'm the guy they call

Eddie

Powers—

and My Business
is fixing
Automobiles

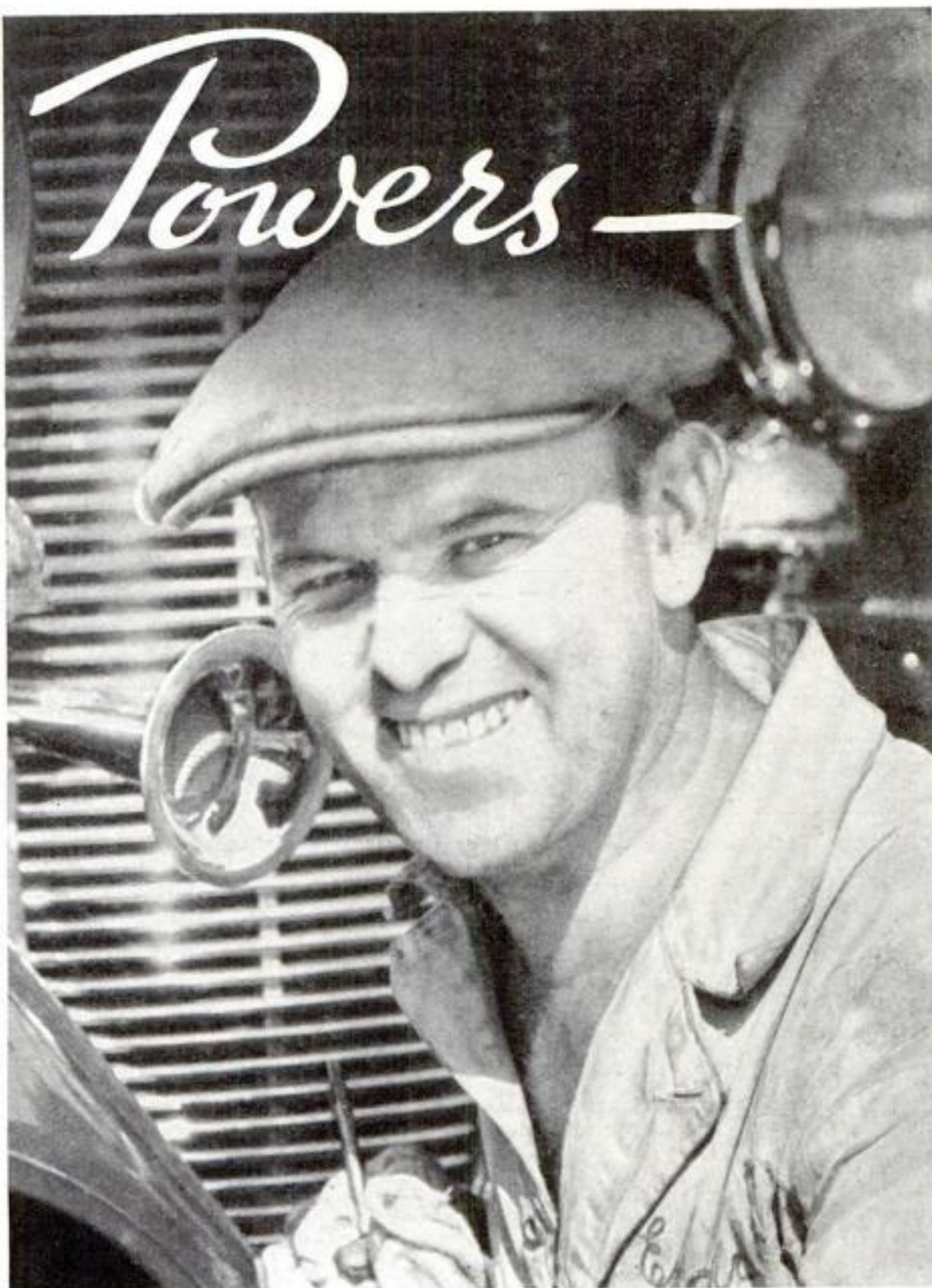
"I'M NOT FAMOUS, and I am breaking into print in this magazine for a funny reason—read on and you'll see why. Not many people know me but here's what those who do say about me:

'There is a little fellow with an up-to-date repair shop opposite the railroad station named Eddie Powers who knows more about automobiles than any man in this part of the country. And, if you want to have your car fixed, or if you want to know anything about cars, go to see Eddie.'

"One day an advertising man who knows me came in and said, 'Eddie, what's the best car made in the medium price class?' I told him, and I also told him why, and he came back and said, 'Let me print what you have just said in an advertisement in a magazine.' I said, 'Sure, why not? I believe it, I know my stuff, so why shouldn't I let you print it?'"

Here's what Eddie said: "When you take cars apart and fix them you get a good look at what makes them tick, and believe me when you get inside, there is a big difference in cars that you do not see when you just look at the paint job. After you have driven in road races for twenty years like I have as the second man with the driver—the mechanic—with your life depending on the parts of the car you are riding in... and you have been foreman in some of the big automobile plants... and for ten years have made your living repairing cars of all makes, I think I ought to know my stuff.

"I look over the cars at the Show every year, and they aren't on the road long before I get a good look at all of them



from underneath. I believe DeSoto is the best automobile made for the money in the medium price field this year. Every major part of this car is nearer right than in any other car for the money on the market. The DeSoto is more 'automobile' for the money than any other car—and by 'automobile' I mean the newest things that the engineers have developed to make cars more economical to drive and more dependable and more comfortable. For instance: Floating Power—it eliminates vibration. Perfected Free Wheeling... Automatic Clutch... Safety Steel Body... Duplate Safety Plate Glass... and a hundred and one other things, including almost everything there is on the most expensive cars in the world. If I were

going to spend around \$800 for a new automobile, DeSoto's the car I'd buy."

Eddie Powers said we could print that statement, and now we ask you to do only one thing. We can't send you a sample car by mail, but we can do the next best thing—put a DeSoto together for you—in an illustrated booklet.

Will you let us send you "The Inside Story of America's Smartest Low-priced Car"?

DE SOTO MOTOR CORPORATION, DETROIT, MICHIGAN
Please send me (without obligation) your booklet, "The Inside Story of America's Smartest Low-priced Car."

Name _____

Address _____

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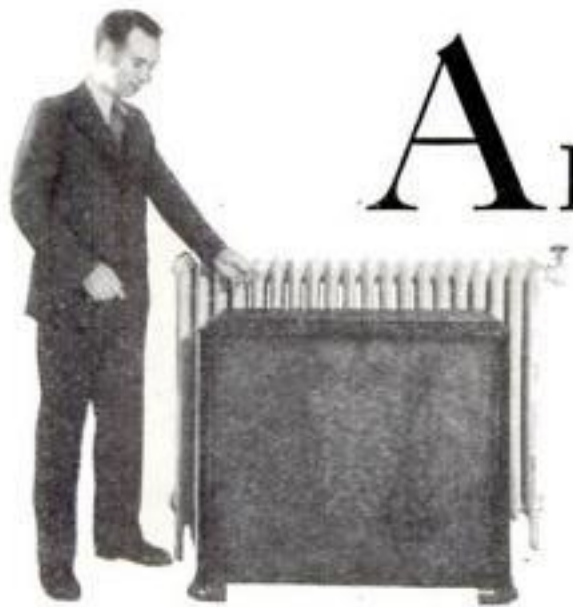
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Below, testing a supplementary air conditioning unit for its dust removing quality. Engineer at right is using a dust counter while girl is releasing dust into the air flow. At right, air conditioner of radiator type at work in home



Relative sizes of an ordinary radiator and of radiator type air conditioner shown above

By R. M. Bolen

Secretary, Popular Science Institute

DRIER than the Sahara Desert," is the way heating engineers describe the quality of the air in ninety-nine out of every hundred heated homes. Most important of all the necessities of life is the air we breathe, yet because of artificial heating methods we live, during the winter months, in a man-made atmosphere far drier than that of Death Valley.

Every year, statistics show, each individual eats some 2,000 pounds of food and breathes approximately 11,000 pounds of air. Millions of dollars are spent annually in selecting and protecting that 2,000 pounds of food, yet little thought is given to the air in homes and offices.

To live comfortably during the winter we heat the air in our homes, but in so doing we make it dry and unhealthful. Heating air increases its capacity for holding moisture. Air properly moistened by Nature, say at zero, contains only one third the moisture content necessary to good health when heated to room temperature. Although a relative moisture content of forty or fifty percent is considered ideal, few homes, tests show, maintain a relative humidity over fifteen percent.

Automatic humidifiers now available make it a simple matter to control the moisture content in heated air. These units, ranging in size from compact, hand-

somely finished cabinets for use in place of radiators to units designed as part of large central hot air plants, insure complete winter comfort in an atmosphere heated and humidified to the proper degree. Humidifiers can be obtained for use with every type of heating system. One design of forced circulation heating plant consisting of an automatic humidifier, oil-burning furnace, and electric blower costs little more than the average oil burner. Warm air plants of this type, having blowers, can also be used in summer to circulate the air and prevent stagnation and the formation of warm air pockets. Besides large central plants, separate blowers and humidifiers can be obtained for use with an existing warm air system.

Complete year-round comfort with cooling and dehumidifying in summer as well as heating and humidifying in the winter is now possible in the small home. Like the humidifiers, these combined cooling and heating units range in size from small radiator-like cabinets to large central air

conditioning systems similar to those used commercially.

Small unit room conditioners of the radiator type are designed for use with existing steam, hot water, or vapor systems. Simplicity of design makes it as easy to turn on the cold in summer as the heat in winter.

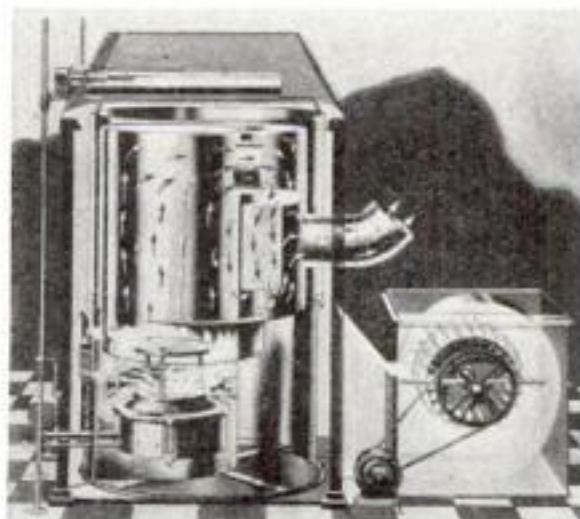
Among the larger heating and cooling systems, complete air conditioning units, as

well as attachments for warm air systems and hot water or steam furnaces, are offered to the home owner. In most cases, these large central plants not only temper the air and control the moisture, but scientifically designed filters or washers remove dust and other impurities from the air. One unit, designed for use either separately in connection with steam or hot water heat or in conjunction with a warm air system, humidifies, filters, washes, and circulates the air in addition to cooling your home in summer.

The cost of air conditioning equipment varies. Cabinet type units that humidify the air in winter range in price from \$150 up, while supplementary humidifiers for use in existing warm air furnaces are less expensive. Complete air conditioning units, combining cooling and heating, are of course more costly.

One has but to remember that sixty percent of man's energy is derived from the air, and that ninety percent of his time is spent indoors, to realize the importance of air conditioning regardless of cost.

Readers interested in air conditioning can obtain further information by sending a self-addressed and stamped envelope to the Popular Science Institute, 381 Fourth Avenue, New York, N. Y.



Sectional view of an oil-burning warm air furnace with automatic humidifier and blower

Our Readers Say

Something Makes Us Think He Likes His Astronomy

THE title of POPULAR SCIENCE indicates that the main object towards which "our magazine" is attuned is to popularize science or explain it in an easy understandable form. Now what I would like to know is why astronomy, the original and oldest of all the sciences (the grand-daddy of them all!), is so apparently neglected in POPULAR SCIENCE MONTHLY. Surely there is no science under the galaxy that can compare with it in romance, interest, and the ability to make a person *think*, the real object of any scientific magazine. Astronomy holds within its palm a multi-variety of subjects, never varying in their intensity of interest and appeal. I am sure that every one of your readers will agree with me when I say that you are not carrying out the promise of POPULAR SCIENCE's title when you so shamefully neglect the oldest of all sciences—astronomy.—B.L.B., Far Rockaway, N. Y.



Can You Imagine Anyone "Just Ignoring" Chicago?

IT SEEMS to me that a large city like Chicago should take more interest in a magazine like POPULAR SCIENCE MONTHLY. After looking over quite a number of editions I find very few letters in your "Our Readers Say" column written from this city. As a matter of fact there was none at all for the last few months. Am wondering whether this column just ignores them, or the readers fail to submit letters important enough to publish.—C.J.S., Chicago, Ill.

Your Pool, D. S. R., Is Just Twelve Feet in Depth

IN THE July issue in "Our Readers Say" column there is a problem about a pool and a reed. The question is how deep the pool is. I think I have the answer. The pool would be twelve feet deep. I have proved this by drawing a diagram.—J.W.C., Jacksonville, Ill.

It's Just Possible You Can Blame Old Man Worry

I SEE by the papers that the death rate from heart disease during the first three months of this year was just about the same as in 1930, but starting with April first the percentage hit a sharp rise. Why? Some people blame it on planetary conditions, but that sounds like the bunk to me. Had hot weather anything to do with it? And drinking iced liquids—non and the other sort? I asked my family doctor but all I got out of him was a grunt. Was that the best I was entitled to? Or is that as much as the wisest could give me? I palpitate for some further information about this important—to me—subject.—J.R.B., Greenville, Ohio.



Here's an Explanation of Full Moon and Frost

R.L.R., Worden, Ill. has a problem he wants answered: "Why a frost does less damage at full than at new moon." Physical geography tells you that tides follow the moon, and as the moon is a big magnet the same as the earth it attracts all matter inversely according to square of distance. This force prevents dew from falling as heavily at this phase. Also our satellite reflects a small amount of heat and therefore prevents a frost having the killing effect at this time as it does when it sets with the sun.—G. D. W., Lansing, Mich.

Problem of Airplane Flight Is All Settled Again

MAY I please make a correction? Several of your otherwise scientific contributors have, at different times, stated that an airplane is pushed through the air by the slipstream. I cannot agree with this statement in its entirety. It is only partly true, because an airplane derives its motive force, or almost all of it, from the partial vacuum in front of the propeller. Therefore, it is easily seen that it is *pulled* through the air. Similarly, a ship is pulled along by the area of partial vacuum in front of the sail.—W.E.T., Harrisburg, Pa.

Only a Cyclone Needed to Give This Car Its Top Speed

IN MY opinion the car, each wheel of which was an engine, illustrated in a recent issue of your magazine, would attain the speed mentioned in your article if it had a cyclone behind it or was taken for a joy ride in an airplane. Many difficulties stand in the way of the production of such a car. One of its weak points lies in the fact that its entire weight, except for tires and rims, is supported by such vital parts as pistons and rods. If one or two of the piston rods broke or the mechanism of the wheels failed to function, the car would be violently vibrated because of the eccentricity of the wheels. This would cause discomfort, or possibly injury, to the occupants. The same result would follow the sudden application of the brakes. I fail to see wherein lies the advantage of this car over the present-day auto.—L.C.K., San Souci, Australia.



Sometimes It's Just as Well to Get Your Terms Right

I ENTREAT E.J.R.R., before inflicting any more pseudo-astronomic junk upon us, to study with care the definition of "centrifugal" force (a primary school dictionary will be sufficient) so as never again to get himself as badly "balled up" as he recently did. The force to which he refers is the *centripetal*, drawing toward the center. The *centrifugal* force, on the contrary, is the force by which the planet tends to *recede* from the center, owing to its

tendency to travel in a straight line (on the tangent) instead of following the curve, to which curve it is held by the opposite tendency of the centripetal. As to his theory itself, it reminds me of what old Josh Billings used to say: "What's the yuse ov noin' so mutch, when so mutch you no, ain't so?"—C.A.P., Monrovia, Calif.

He Would Like to Know How Bell Announced Spirits

I WONDER if I could get an answer to this problem in your columns, "Our Readers Say." Here it is. At a recent "Spiritualist Convention" they had a "call bell," invented by Henri Vandermeulen of Loupoigne, Belgium. Same was exhibited on the speaker's table. Would ring as the delegates came near it. There was no one near or touching the table at the time it was ringing. Would ring once — meaning there was a "spirit" there — as a person passed. Now what I should like to know is this: is there any way—by radio or otherwise—whereby this "call bell" could be rung without anyone being near? These people would have us believe it was the work of spirits. Now you fellows that mean to answer this, please don't get sarcastic. There are a good many honest and brainy people who believe in spiritualism. I would like to know if this "bell test" is on the square.—W. B.M., Petoskey, Mich.



Maybe the Big Fellow Would Simply Loaf Along

WILL your readers please help me answer this problem: If on the return groove of a bowling alley we allow first the largest ball to roll back by gravity alone, and then the smallest, which will take the longer time to make the trip? Neither one is to be given a push.—P.C., Troy, N.Y.

Anyway, You Must Admit, It Was a Right Nimble Fly

NO MORE proof is needed to convince me that it does rain fish. I have definite proof that in 1908 at Clinton, Mo., it rained fish. After a heavy downpour of rain a man walking through the lawn was amazed to find a lot of fish from one to two inches long. Here is a problem to work on. Two trains are approaching on the same track from towns thirty miles apart. Train D at the rate of ten miles an hour; train E at twenty miles an hour. A fly flies ahead of train E until it meets train D. It then turns and flies ahead of train D till it meets train E. It keeps up this shuttling process until it is finally crushed between the two trains



as they collide. The fly goes at the rate of thirty miles an hour. How long did it fly, and how much distance did it cover before it was killed? As for these kickers, it would be great if they would turn into mules so they would have a right to kick. Nobody makes them read POPULAR SCIENCE.—P.V.S., Florence, Mo.

Who Else Wants Articles on Railroads and Farms?

RAILROADS are a commonplace, but to a knothed like me, all machinery and its operation is fascinating. What I want to know is what makes the wheels go round, and how, in a big railroad terminal like the Grand Central, New York. Getting in and out of one of these places is, to me, a bewildering experience. I don't see how it's done. It looks like a Greek maze, but I suppose it's really highly systematized and orderly. Why don't you take us underground and show us how the whole business works? I'd eat up such an article. Maybe others would, too. Also, to us city raised fellows, a description of how a 1,000-acre farm is run would be juicy reading. Compare its present operation with thirty years ago and give the whole dope from fall plowing to next year's threshing. Sorry I haven't any more ideas to slip you right now.—P.H., New York City.

This Boy Spoke Up and Got Himself Seen

"SPEAK to me, my lad, so I can see you." This phrase, spoken by a philosopher of ancient times, could be applied to B. R. "You have spoken and were seen." This is in reply to his criticism (if it could be called criticism) of E. A. T.'s letter on our traffic signals. Many a splendid idea was choked at its birth only because of fear of ridicule by "critics" who can easily prove that the idea is wrong since it does not run along conventional tracks.—C.M., Detroit, Mich.

An Echo of Approval Comes Out of Idaho

THE "Kick-o-graphs" under the page title "Our Readers Say" always give me many smiles. Those radio articles by Alfred P. Lane and John Carr are fine and really tell us something, and I only regret that we cannot have more of such writing. However, I, for one, am very glad for that much, and I have found them very helpful in giving me a little insight into what goes on inside a radio.—W.A.M., Coeur d'Alene, Idaho.

Do You Know How to Run Molten Iron Through Pipes?

HERE is a little problem that I hope you may shed some light upon. I know it is possible to pipe molten lead, but is it possible to pipe molten iron? I anticipate the difference in their respective melting points, but aren't there alloys with a melting point higher than iron? Perhaps if this question were brought to the attention of your readers they might be able to offer some suggestions. This is not a mere whim of mine, but is based upon a proposition that fronts an industry that I am connected with. So I assure you that any information or references that you may bring to my attention will be most sincerely appreciated.—W.P., Jr., Garwood, N.J.



Bridge as a Science and Also a Big Headache

BRIDGE problem submitted by A.H., Forest Hills, L.I., is neat enough to give a thrill when you get it. Cards are distributed thus: South, diamonds, queen; spades, 5, 4; clubs, jack, 10, 6. West, diamonds, king, 10; spades, 7, 3; clubs, 9, 5. North, diamonds, ace, 9; clubs, 8, 2; hearts, 5, 6. East, diamonds, 8; spades, 6, 2; clubs, 7, 4, 3. Hearts are trumps. South leads 10 of clubs; west, 5; north, 8; east, 3. South leads 4 of spades; west, 3; north 5 of hearts; east, 2. North leads 6 of hearts; east, 8 of diamonds; south, queen of diamonds; west, 7 of spades. North leads ace of diamonds; east, 4 of clubs; south, 5 of spades; west, 10 of diamonds. North leads 2 of clubs; east, 7; south, jack; west, 9. South's 6 of clubs is now good. If east discards a spade instead of the 4 of clubs, south throws away the six of clubs and his 5 of spades then takes last trick.—O.T., Dubuque, Iowa.

Evidently This Writer Has No Time for Astrology

IN REPLY to J. P. R. of Detroit, Mich., I wish to remind him that astrology is not quite as old as the world itself. Astrology was originated by the Chaldeans of Babylonia, and certainly the earth was in existence for at least two or three years before the Chaldeans arrived to originate their fascinatingly foolish institution of bunkum known to the more gullible as astrology. I can see no reason why astrology should be given any chance to exist. It certainly has not contributed anything of material value to humanity. Astrology can point to no accomplishment; it has no theories, hypotheses, or laws. There is nothing resembling "wonders" in this occult foolishness. All there is to astrology is hot air. If astrology were able accurately to predict all coming troubles, wouldn't we be able to avoid them? Anyone can make a guess and guess more accurately than these occult star gazers who can't distinguish a star from a planet. No doubt it was astrology that predicted the discovery of Pluto, and of course the astrologers knew right along how Pluto was going to affect the lives of the poor fools who believe in the "occult science."—R.M., Chicago, Ill.

Kind Words and Cusses Keep the Wheels Turning

I HAVE been taking your magazine for some time, and it is the best out. You sure do not object to having people "cuss" you out. I get as much kick out of "Our Readers Say" as I do from the rest of the magazine. My hat goes off to B. S. L., East Milton, Mass. He has the right idea. What we want is still more chemistry. L. S. of Philadelphia, Pa., also has the right idea. Why spoil a perfectly good science magazine with unscientific fiction?—E.O.B., Commerce, Texas.

Suggests Vacuum Tube for Real Study of the Stars

IS ANYONE using the vacuum tube to look at the stars? I have been thinking it would be possible to use television to pick up the planets and show them enlarged on a screen. If this can be done it would not be necessary to build enormous telescopes.—H.R.H., Livermore, Calif.

All You Need to Know About Falling Bodies

TO A.J.P., Cement City, Mich.: As a physics student I wish to put you wise that it is now a known fact that all objects fall with an equal

velocity. The formula, which can be found in any high school physics text, is as follows: Where V =Final Velocity g =Acceleration (32 feet per sec.) t =Time D =Distance $V=\frac{1}{2}gt$ $D=\frac{1}{2}gt^2$. It is also stated in physics texts that all computations relate to a vacuum. This would mean that the feather would fall as fast as a lead ball because there would be no air resistance.—E.O.S., Millintown, Pa.

Most Likely Someone Sits on the Safety Valve

You must know most everything, and what you don't know your readers do, so tell me this: Why doesn't the world blow up? In the center of the earth you've got heat and steam and gas and oil—everything necessary for a fine explosion—and nothing happens! Why? The scrawny little lazy volcanoes that are on the job only now and then could hardly furnish sufficient vent to relieve the enormous pressure. How else could it get relief? Isn't it true that in the age of the volcanoes the surface of the earth was changed by a thousand eruptions? Can't it happen again? If so why not now? Looks to me as if this is as good a time as any, and it might prove a heroic means of solving the present depression—of which you may have heard. Can anyone tell me what I'm driving at and if so why? Glad to get information.—C.E.S., Mason City, Iowa.



Many Wise Men Think Both Statements True

WILL someone please explain this to me: We are descended from something similar to the apes, or so it has been practically proven. Yet we are descended from Adam and Eve. They, according to the Bible, were the first man and woman. Which source is one to believe? If we choose apes as our ancestors, we almost say that the Bible does not tell the truth. If we choose Adam and Eve, we are disregarding proofs already shown us by scientists. Will someone answer this question?—M.S.R., Electra, Texas.

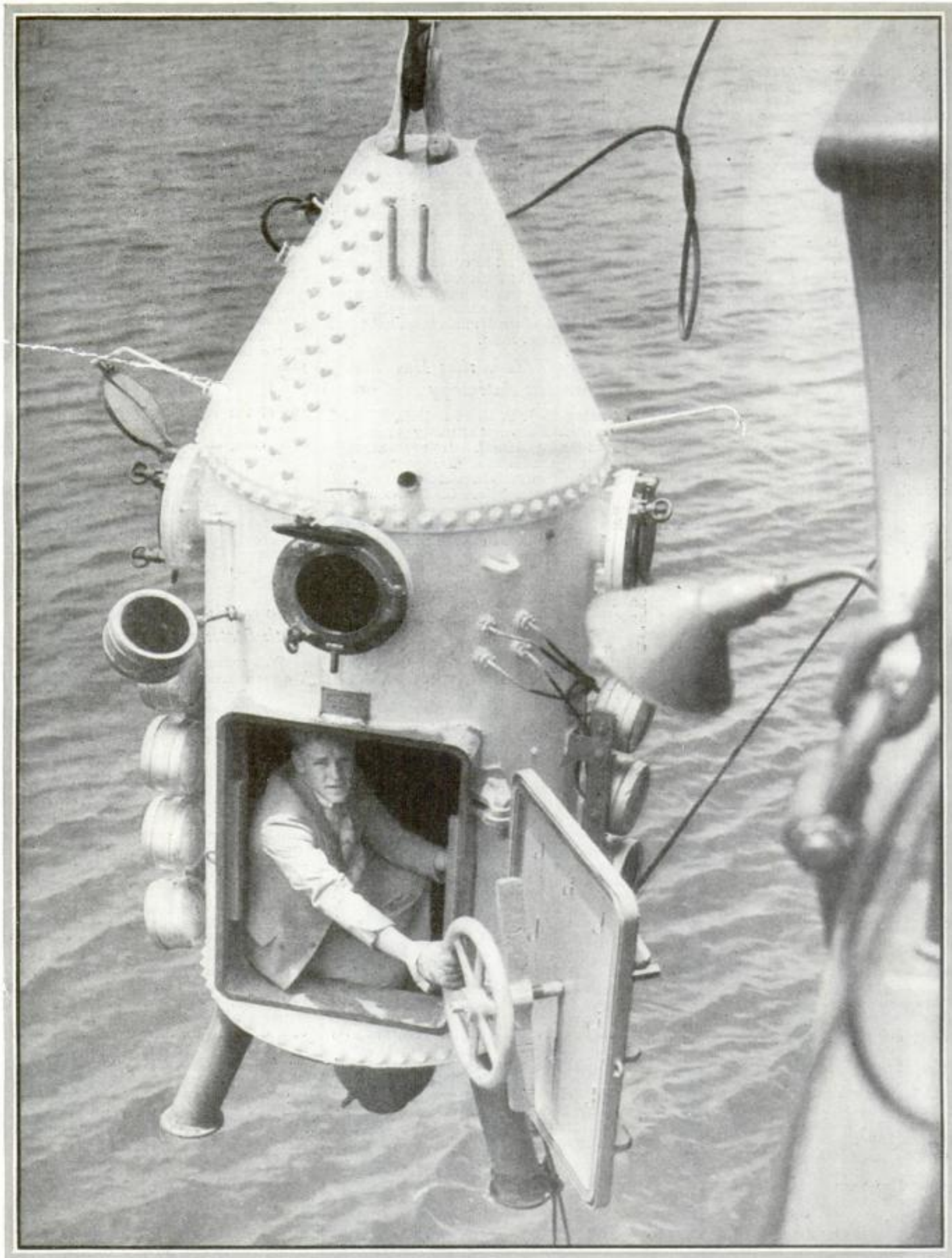
His Plea Is for More Mathematical Problems

LIKE many of your readers I should like to see more mathematical problems but not of the elementary type that usually appear. My criticism of the problems submitted is that, while they are all elementary, many of them presuppose certain assumptions. For instance in N.M.M.'s problem one would have to assume the earth's equator to be a perfect circle of a definite size, instead of being, as it is, merely an approximation. With this assumed the problem is then nothing more than getting the radius of a circle of which the circumference is known.—G.N.P., Meriden, Conn.

Our Guess Is Horace, but Probably It's Leopold

I HAVE a problem I want you to ask someone else to solve for me. "If a man by the name of John married a wife by the name of Marrian, and they had six children by the name of James, Walter, Joan, Jean, Bell, and William, which one of the youngsters would be the first to marry, and which one would be last? I ask you, not you me. Hoping you publish this soon, I remain your Raymondville correspondent.—I.K.J., Raymondville, Texas.





Diving Bell for Sight-seers

Visitors to a resort on the Pacific Coast can now view the wonders of undersea life through the portholes of a submarine chamber that lowers them one hundred feet beneath the waves. Colored lights illumine the weird vistas, while elaborate safety devices guard against any possible disaster. See page twenty-eight for description

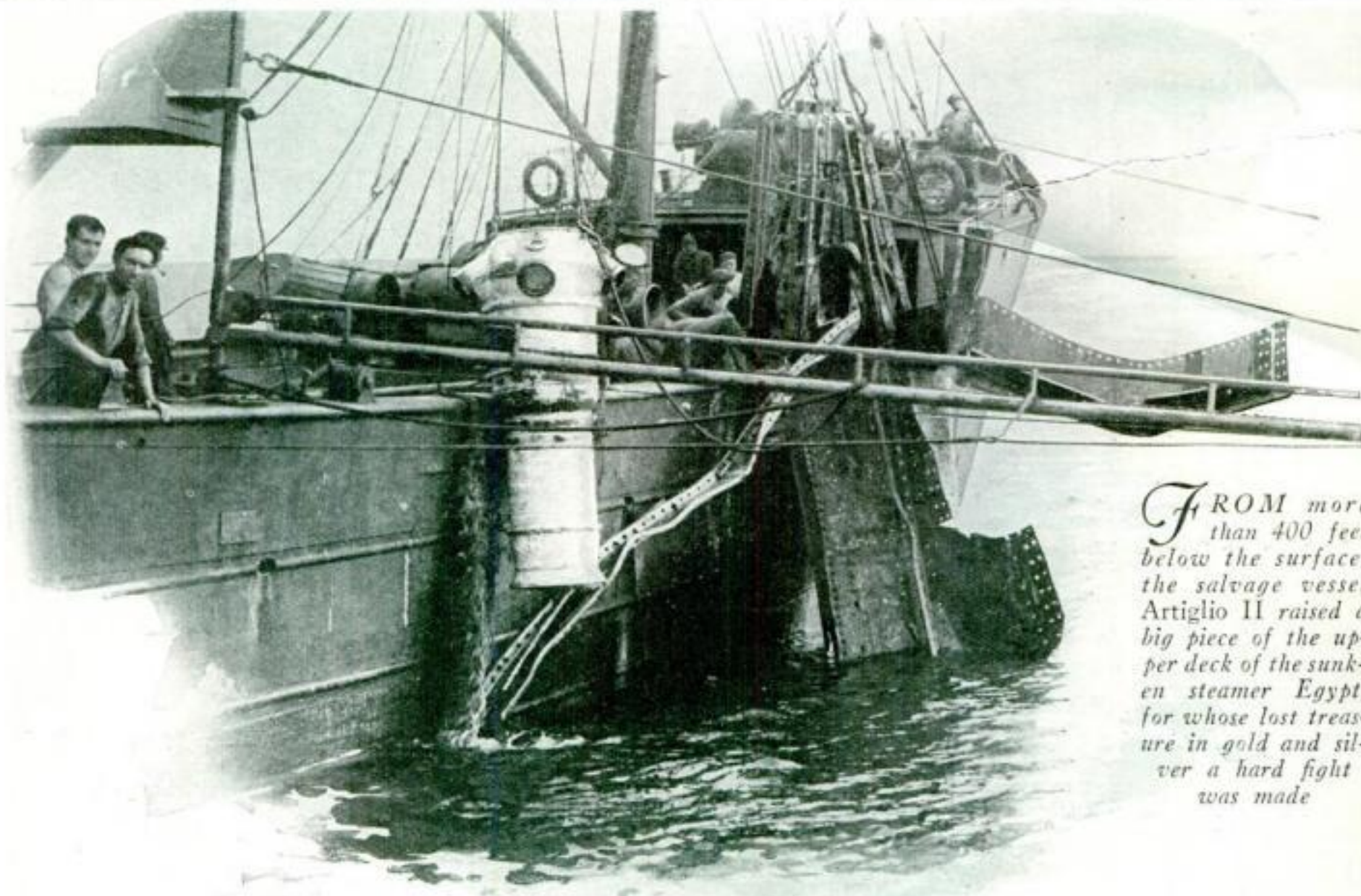


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RAYMOND J. BROWN, Editor



FROM more than 400 feet below the surface, the salvage vessel Artiglio II raised a big piece of the upper deck of the sunken steamer Egypt, for whose lost treasure in gold and silver a hard fight was made

Take Millions from Sea AT 400-FOOT DEPTH

By
Michel Mok

A MILLION dollars in gold scooped up from the sea in a day! This was the news flashed by wireless from the Italian salvage ship *Artiglio II*, whose divers recovered part of the \$5,000,000 in gold and silver that went down with the liner *Egypt* off Brest, France.

Their success followed a three-year battle with ocean tides and storms, in the course of which fifteen men were killed and two ships wrecked.

The million-dollar haul was only a beginning. As this was written, about half of the lost treasure had been dragged from the ocean, and the salvage work was progressing at the rate of more than \$100,000 worth an hour.

The venture owed its success to the use of a new steel diving bottle, or shell, that makes possible the recovery of treasure at depths too great for the ordinary diving equipment. As the Italian experts who raised the *Egypt's* precious cargo were the first to put this device to a practical test, they may be said to be the pioneers in modern deep-sea salvage work.

With more than \$5,000,000 in gold and silver in the steel strong-room of her hold, the British liner *Egypt*, bound from London to Bombay, India, in May, 1922, was rammed in a fog by a French freighter off the coast of Brittany, and sank in 400 feet of water.

Her chief radio operator, in the twenty minutes that elapsed before the sinking, flashed the SOS call. From his signals,

wireless stations ashore, with their direction-finding apparatus, were able to take bearings. These, and the position recorded by the captain, who survived, aided in locating the wreck. Out of sight of landmarks, it lay nearly thirty miles from the nearest coast.

Lloyd's underwriters, owners of the cargo, in turn commissioned Swedish, French, and German divers to search for the *Egypt* and retrieve the lost fortune. Their efforts were fruitless. Finally, in June, 1929, the Marine Salvage Co., of Genoa, commonly known as the "Sormima," took hold of the job.

Two vessels, the *Rostro* and the *Artiglio*, were sent to the scene. They at once began the monotonous and often dangerous task of hunting for the wreck. That job alone consumed fifteen months!



Dynamite bombs were fastened to spars before being lowered to blow the sunken *Egypt* to pieces. At right, the crew of the *Artiglio* is busily engaged sorting the treasure which was found in the strong room of the ship sunk off the French coast



The treasure hunters believed the floor of that section of the Atlantic to be smooth and sandy. A steel cable, 2,000 yards long, was stretched between the two boats which, steaming on parallel courses like war-time mine sweepers, set out to drag it along the bottom. They had gone exactly five minutes when the sweep caught. Could it be that, by an incredible stroke of luck, the *Egypt* had been found? The answer came when the cable slipped off the obstacle. Hauled in, it was covered with fragments, showing it had hit not a wreck, but a rock. The ocean bed thereabouts, the salvagers discovered, was a mass of jagged rocks.

That was the first blow. Thereafter, they weighted the sweep at both sides so that, instead of hanging in a slack loop, it traveled freely, high enough to miss the rocks; low enough to catch the wreck.

That summer the weather was so bad the salvage ships were laid up in Brest harbor for days at a time. One morning toward the end of June, as the two boats were plowing through a choppy sea, the sweep stuck. Rocks again? Not this time. The cable could not be budged.

After three hours of tugging, the cable snapped. Near the break, particles of rust and traces of white paint stuck to the sweep. This proved a wreck had been found, but it was not certain it was the *Egypt*.

After the adventure of the broken sweep, storms and fogs forced the ships to abandon the hunt for the season. No definite clue had been discovered, but the salvagers had become familiar with the territory they had to search, and on several occasions they had made satisfactory tests with their new diving equipment.

In the old rubber diving suit, a diver can descend to a maximum depth of 120 feet. Beyond that, the water pressure becomes too high for a human being to endure. The *Egypt* lay in 400 feet of water, so the rubber gear could not be used. Looking for new apparatus that would do the trick, the salvagers found two devices which they adapted to their needs.

During the last fifty years, English and



Here goes a diver down to the sunken wreck with his observer, hanging in ropes above him

German inventors have produced several types of deep-sea diving equipment. They solved the problem by inclosing the diver in a metal case strong enough to resist the water pressure without any corresponding pressure inside. A man in such a case could live and breathe normally. Air was supplied him at atmospheric pressure through a pipe from the surface, with another pipe to remove used air; or he could use a respirator absorbing the

poisonous gases from his exhaled breath, and supply himself with oxygen from a tank.

The old rubber suit, however, permits the diver to move about freely, walk through the sunken ship, or do manual work. To retain this advantage, the inventors of the early metal equipment designed different types of undersea suits of armor that proved hopelessly clumsy.

This difficulty was partly overcome by a German school teacher, who designed a suit with flexible joints working on ball bearings rolling over rubber rings. British engineers improved his design, making it more compact and the metal lighter. Commander Giovanni Quaglia, of Genoa, head of the Sorima, perfected this suit. It is one of the devices used by his divers.

Meanwhile, an English firm making diving apparatus designed a simple deep-water bottle or shell in which one man has room to stand or sit, breathing the same air over and over again through a purifying respirator, and carrying his own oxygen supply. The steel bottle has observation windows, electric searchlights, and a telephone connecting it with the surface. As it is meant to be lowered to the wreck by a salvage ship and used as an observation post by the diver, who directs the operations of the men aboard, this one-man submarine is called the "eye." In modified form, this eye also is used by the Sorima people. It has proved the most effective piece of equipment in their salvage work on the *Egypt*.

Search for the sunken treasure ship was resumed in June, 1930. The *Artiglio*, accompanied by the *Rostro*, swept the ocean bottom for weeks. They found the wreck—of a *(Continued on page 92)*

Human Bomb *to Plunge Four Miles*

Dare-Devil Parachute Jumper to Leave Plane in an Aluminum Shell

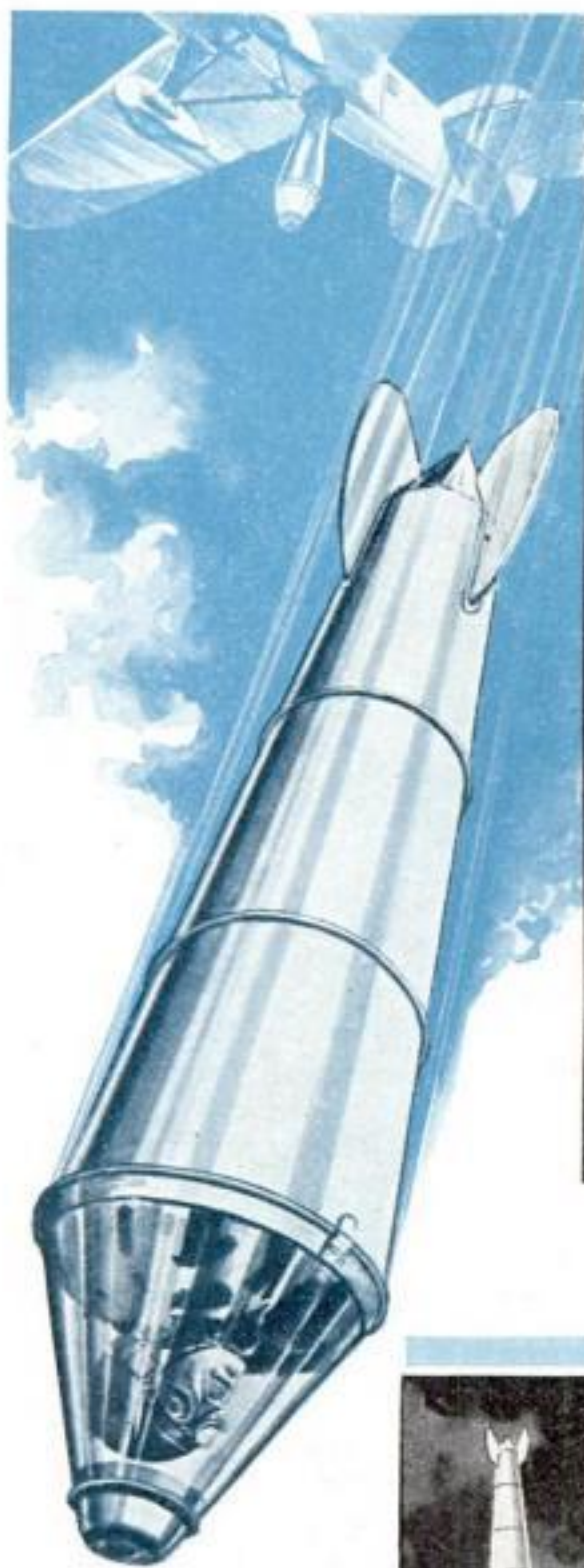
THE world's first human bomb will plunge earthward, within the next few days, from an airplane four miles above Salisbury Plain, England. Spectators will see a tiny speck, hurtling downward at a speed that may reach 500 miles an hour, before it is near enough to be recognized as a glinting projectile of aluminum. Sealed head first inside the hollow shell, John Trantum, Danish parachute jumper, will be making a desperate gamble with death.

Will Trantum be dashed to pieces before the horrified crowd? The daredevil experimenter believes not. A few seconds before he would crash, he announces, he will pull a release lever within the jointed shell that he has just completed for the attempt. If all goes well, it will open and hurl him out, and a parachute on his back will ease him down to a safe landing.

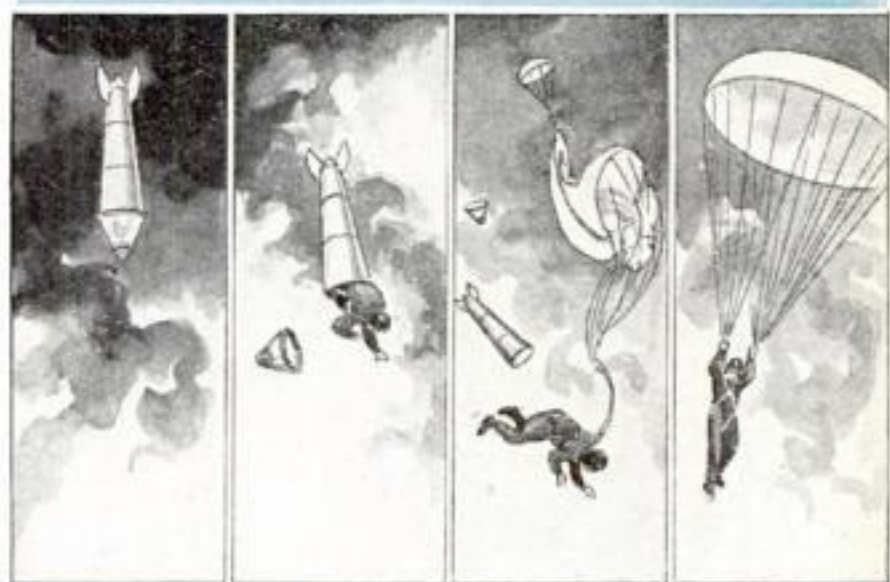
His perilous experiment has a serious scientific purpose. It will test the feasibility of a plan for landing passengers from high-flying stratosphere airplanes of the future.

Aviation experts foresee the day when airliners with air-tight cabins will fly eight to ten miles above the earth, where the thinness of the upper air or "stratosphere" will permit almost incredible speeds. In line with such speed, the idea of dropping passengers without stopping to land the plane has aroused speculation. An ordinary parachute jump from a stratosphere plane probably would be fatal because of the lack of oxygen and the reduced pressure of the atmosphere. Therefore the alighting passenger would need an air-tight jacket for protection during his fall.

Will Trantum's venture show such a plan practicable? Put yourself in his place, and you may imagine the sensations of a person landing from a stratosphere plane of the next decade or two. "Over London airport!" announces the steward. He leads you to



John Trantum, parachute jumper, standing beside the aluminum shell in which he will drop from four-mile-high plane, falling head first as in drawing at the left



The four stages of Trantum's sensational feat. 1. The shell drops from the plane. 2. At 5,000 feet, the dare-devil plunges from the shell. 3. The parachute opens. 4. Near the ground



Aluminum shell with cap removed and dare-devil ready to be sealed inside it

the cabin amidships, and points to a tubular shell. You step in, with your parachute strapped to your back. He folds down the lid and your shell is slipped through an air lock and trapdoor.

You are falling head foremost. The earth rushes up at you, and you remember the steward's instructions. "Open up as soon as you can see the machines on the field." When the dots amid the green patches below you become airplanes, you jerk the release lever and leap free of the opening shell. Your parachute unfurls and you swing to earth after your breath-taking fall from the stratosphere.

Smoke Screen Hides Big Power Station



Below, laying network of pipes that discharge smoke screen chemicals. Right, man with hand apparatus to supplement the pipe system. Left, smoke screen sweeping over power station a few seconds after the nozzles were opened.



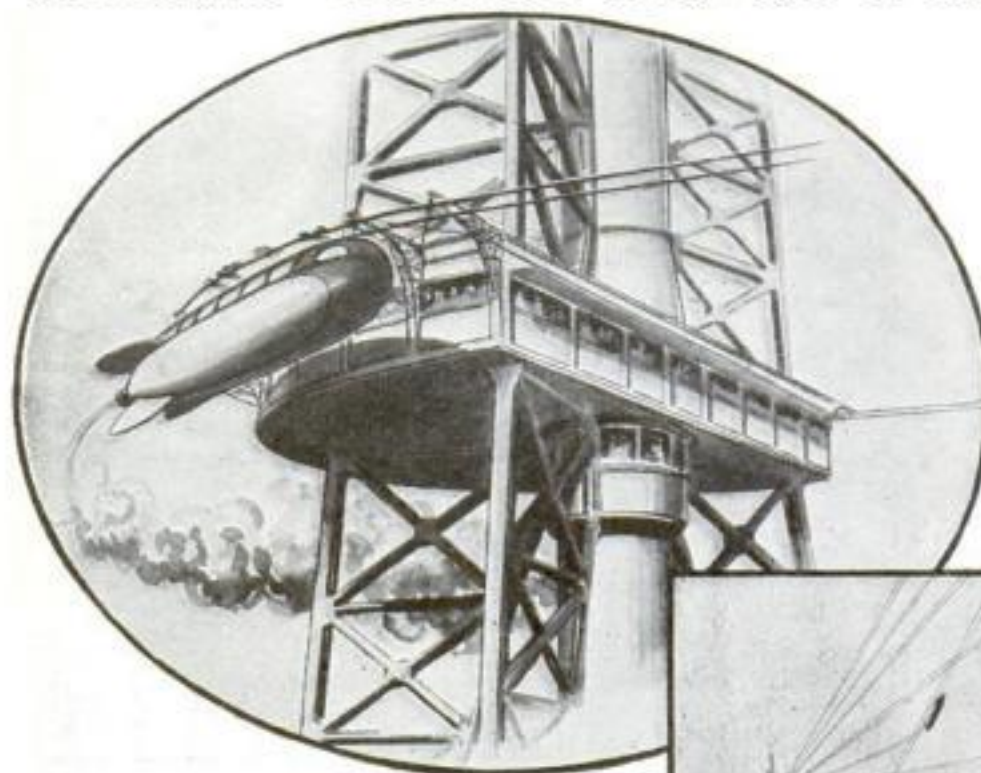
MEMORIES of wartime air raids were revived in Germany the other day when government officials witnessed a remarkable demonstration of smoke screens for industrial plants. During a mimic air attack, the power station at Friedland, which supplies all of East Prussia with electricity, was completely hidden from "enemy" pilots by a thick white cloud so that bombers could not find their target.

A network of pipes was first laid about the plant, so arranged that chemicals from a battery of drums could be ejected simultaneously from 500 nozzles to produce the

smoke. Men with hand tanks were stationed at strategic points to supplement the main system. At a prearranged signal, the whole apparatus was thrown into action. Within only a few seconds, a blanket of impenetrable mist swept over the power

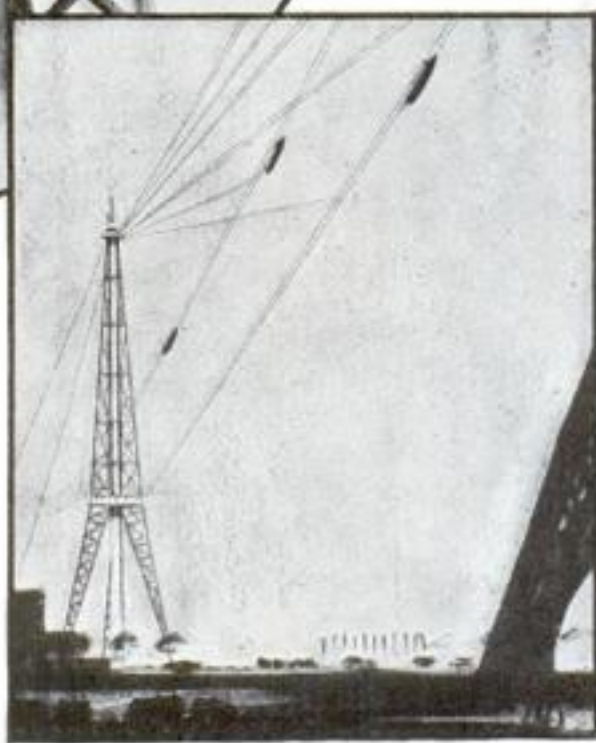
house, shrouding it so effectively that attack from the air would be vain. The method was perfected by a former army major, and is designed to protect power stations, railway terminals, ammunition dumps, and industrial plants.

"ROCKET" CARS TO RUN AT WORLD'S FAIR



Architect's sketch, below, shows one of two 600-foot towers between which will whirl the "rocket" cars riding on cables. Left, platform, reached by elevators, from which passengers will start on their thrilling ride.

RIDES in "rocket" cars await visitors to the World's Fair in Chicago, next year. Bullet-shaped vehicles of glass and aluminum will speed on cables between two 600-foot towers a quarter of a mile apart, giving sightseers a magnificent aerial view of the fair grounds and buildings. The cars will spout colored steam, giving them the semblance of being propelled by rockets, and spotlights will follow their progress at night. High speed elevators are planned to convey passengers to and from the tops of the towers. Engineers estimate that the cost will approximate one million dollars.



BATHER DRESSES IN BAG

NO BATH house is needed for a change to swimming costume, when the bather is provided with a new "dressing bag" of heavy duck. The user disrobes inside it, hanging his clothes upon convenient snap fasteners. Coat and shoes are removed before entering the bag.

Earthquakes Foretold By Use of New Tiltmeter

A MACHINE that may solve the problem of predicting earthquakes in time to warn persons in affected areas of their peril has just been invented by George E. Merritt, of the Bureau of Standards, in Washington, D. C.

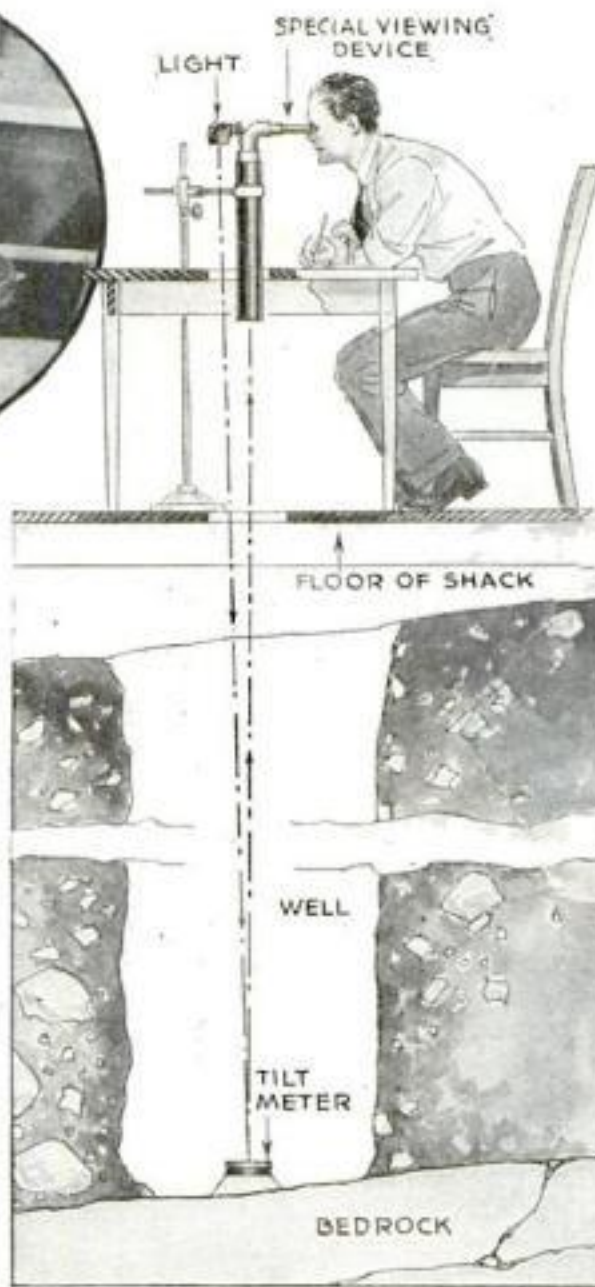
It is known as a tiltmeter and resulted from a discovery made several years ago by Japanese scientists. A short time before the actual quake occurs, they announced, a tilt takes place in the earth's crust. This suggested to Merritt the possibility of developing a machine that would record slight tilting of the earth's crust and warn of an approaching quake.

After several experimental instruments had been constructed, he devised his tiltmeter. Embedded in the earth at the bottom of a pit or well are two parallel reflecting surfaces, a quartz plate and a tray of oil resting upon it. They reflect a ray of light to an operator above who watches through a special device. Any tilting of the earth's crust throws the two reflected beams out of alignment and produces an effect known as "interference fringes" by which the angle of tilt can be measured with the optical instrument through which the operator is looking.

The new apparatus is said to be so sensitive it will measure any change that takes place in the earth's crust within the space of one-tenth of a second. According to the



Tiltmeter from which light is reflected to warn of an earthquake



Drawing shows tiltmeter in operation. Light from helium lamp hits fluid surface and quartz plate resting on bedrock. Tilt in earth's crust changes angle of light which suggest approaching quake



George E. Merritt, of the U. S. Bureau of Standards, peering through a special device at light of helium lamp reflected from the tiltmeter

inventor, several of these instruments located at different points in a section of land would give data that would record any warning movements in the entire countryside.

In addition to giving warnings of approaching earthquakes, the tiltmeter, Merritt points out, could be employed by engineers in constructing large buildings, dams and bridges to determine earth shifts so structures can be specially designed to resist them.

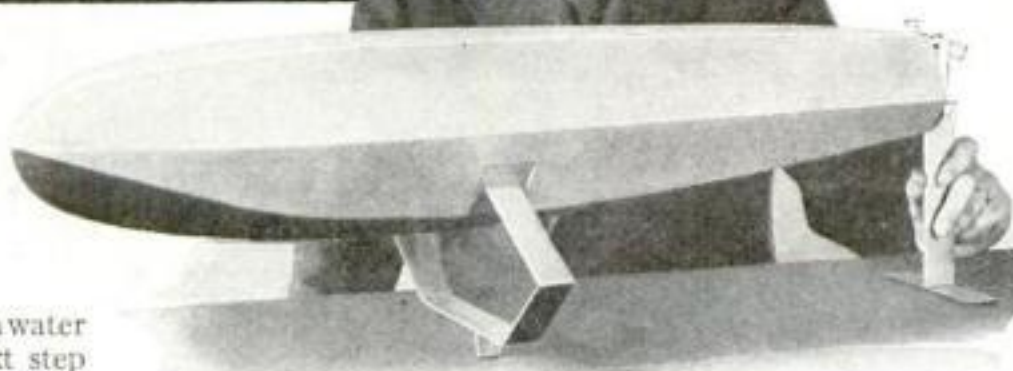
WINGED SPEEDBOAT ALMOST FLIES



Towed at high speed this finned model of a speedboat clears water



Dr. Oskar G. Tietjens exhibits his model of a finned speedboat that has met severe tests and proved fast and stable



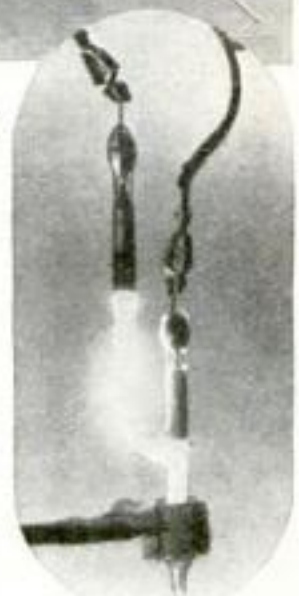
Will wings on water craft be the next step toward greater swiftness in transportation? Simply by attaching two narrow planes to the hull, the speed of any power boat up to fifty feet long may be nearly doubled, according to Dr. Oskar G. Tietjens, Westinghouse research engineer. The planes, or wings, lift the boat almost entirely out of the water and remove most of the frictional resistance. Dr. Tietjens has verified his cal-

culations with a torpedo-shaped model supported on fins and towed from another craft. Though it looked strangely topheavy, the model showed amazing stability in tests and the designer expresses his confidence that it will prove surprisingly seaworthy. Dr. Tietjens recently designed a street car streamlined for speed.



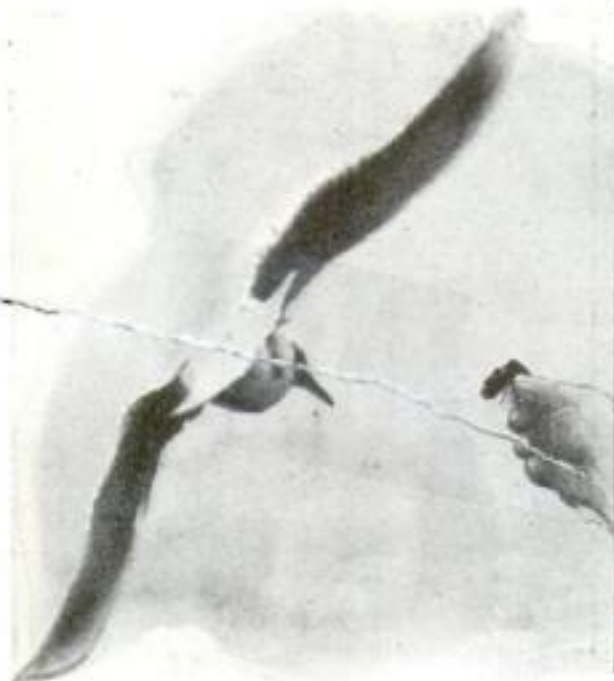
VAPOR LAMP TINY BUT POWERFUL

SO SMALL that it can be held in the palm of the hand, a pocket-size lamp using mercury vapor has been perfected by two members of the University of Cincinnati's physics staff. Intended primarily for scientific work, the new lamp provides a compact source of intense illumination. Its construction prevents sparking and blackening of the glass.



Small lamp gives brilliant light

Sea Gulls Teach Man Secret of Flight on His Own Wings

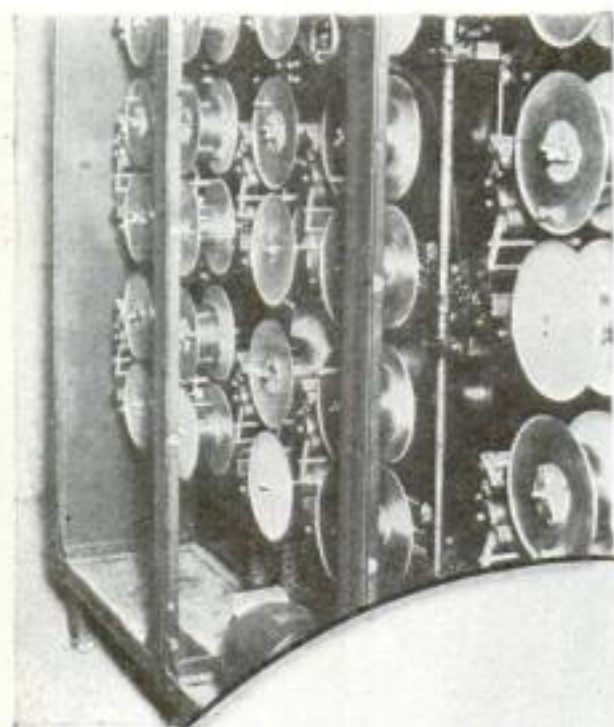


CAN human beings ever hope to fly like birds, using nothing but muscle power? Through a study of sea gulls, French scientists are seeking to learn whether this is a chimerical dream or a practical possibility. First results of the observations, presented recently to the French Academy of Sciences, favored the practicability of man powered human flight. If a man could master a peculiar lunging motion discovered to

be characteristic of gulls, the investigations suggested, he might be able to sustain himself in the air by flapping especially designed wings. Calculations included in the report indicated that a man who would emulate the birds, weighing 220 pounds with the weight of his wings included, could remain aloft with an expenditure of only one-eighth of a horsepower. This theory will soon be put to a test.

In an effort to discover the secret of birds' flight, movie films of sea gulls were made. French scientists are now studying them in the belief that man will be able to fly as birds do on wings flapped by his own power

EVER-MOVING LIGHTS COLOR FOUNTAIN



AUTOMATICALLY controlled "movie reels" now govern lights that illuminate, with ever-changing color effects, Chicago's famous Buckingham Fountain, largest of its kind in the world. Bands of film traveling over these reels carry narrow, irregular strips of copper. The metallic strips make electrical contacts and thus control the tubes and dimmers that for a full hour blend and change the lighting without repetition of a single effect. The process then automatically repeats itself. Hitherto the lighting effects have been under manual control and the light changes were made once every minute. The movie reel makes possible more rapid and brilliant changes.



Upper left, control cabinet through which narrow strips of copper pass, automatically making and breaking the current so that light, illuminating fountain, is constantly dimmed and brightened



STEAM FROM DEEP WELL TO RUN BIG DYNAMOS

STEAM from the interior of the earth will soon run powerful electrical dynamos at Rome, Italy. In the newest project to harness subterranean heat for power, following similar successful experiments in the past, wells are being bored 900 feet deep to tap the steam. The photograph shows one of the wells just after it had been holed through, spouting a geyser of vapor. A zone of volcanic activity is responsible for the store of natural power.

Factories That Poison Air Are Raided by German Officials



Left, loading air-testing apparatus into car preparatory for raid on factory in Germany. Raids are made to save crops from the poison fumes



Below, raider sets up receptacles in a cornfield to catch impurities in the air. Right, air samples being analyzed within sight of chimneys of offending factory

SURPRISE raids are now made by experts of the Prussian State Institute for Air Hygiene, when fumes from factory chimneys are suspected of injuring farmers' crops in certain parts of Germany. In response to a farmers' letter of complaint, scientists of the department load their twenty-seven trunkfuls of apparatus in motor cars and visit the scene. Upon their arrival, receptacles on poles are set up. Their mushroom domes cover porous collectors



soaked with liquid to absorb foreign vapors in the atmosphere. The samples thus obtained are examined on the spot. If air pollution is discovered, a report of the findings is made to the offending factory owner and the condition is corrected. Evidence obtained by the Institute's raiders has also aided in deciding lawsuits over poor yields from land.

TURRET ON PLANE HOUSES GUNNER



GUN turrets, usually associated with battle-ships, have now appeared on fighting craft of the air. One of England's newest military planes houses the machine gunner in a transparent, revolving cage. The gun is fired through the single open sector of the turret. Protected from the wind, the gunner is able to take careful aim at his target. The photograph at the left shows the new turret-equipped plane as it appeared during a recent pageant of the Royal Air Force at Hendon.



GOLFER'S RANGE FINDER GIVES DISTANCE TO HOLE

DESIGNED especially for the golfer, a range finder enables him to determine instantly the distance to the hole whenever the flag that marks it is visible. The user holds the device about twenty inches from his eye and sights through its tapered slot at the flagpole, first lining up its base with the horizontal or bottom edge of the opening. The range-finding card is then moved to right or left until the pole just fills the opening, at which point the distance is read off in yards from a numbered scale. With this information, the player can decide which club to use.

MUSIC SHORTENS WAIT AT PHONE

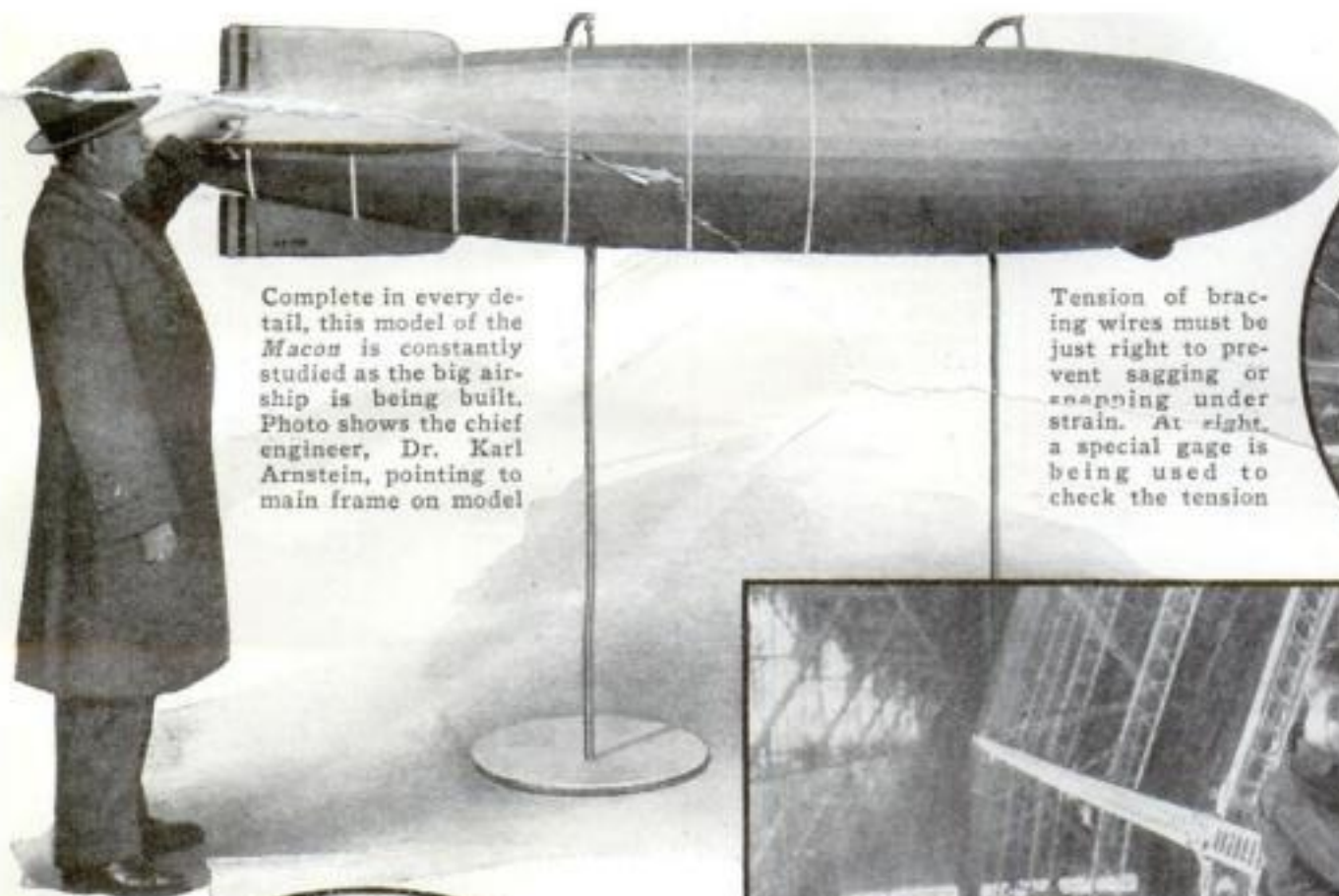
THOUGH telephone service abroad may be less prompt than that to which Americans are accustomed, delays are not always arduous. To soothe the feelings of impatient subscribers, a British telephone company recently installed a phonograph in one of its London exchanges. While a caller is waiting for his party to answer, the operator switches him over to the phonograph and he enjoys a program of light music during the interval.



SOAPSUDS COOL MOTOR AND RAISE THE POWER

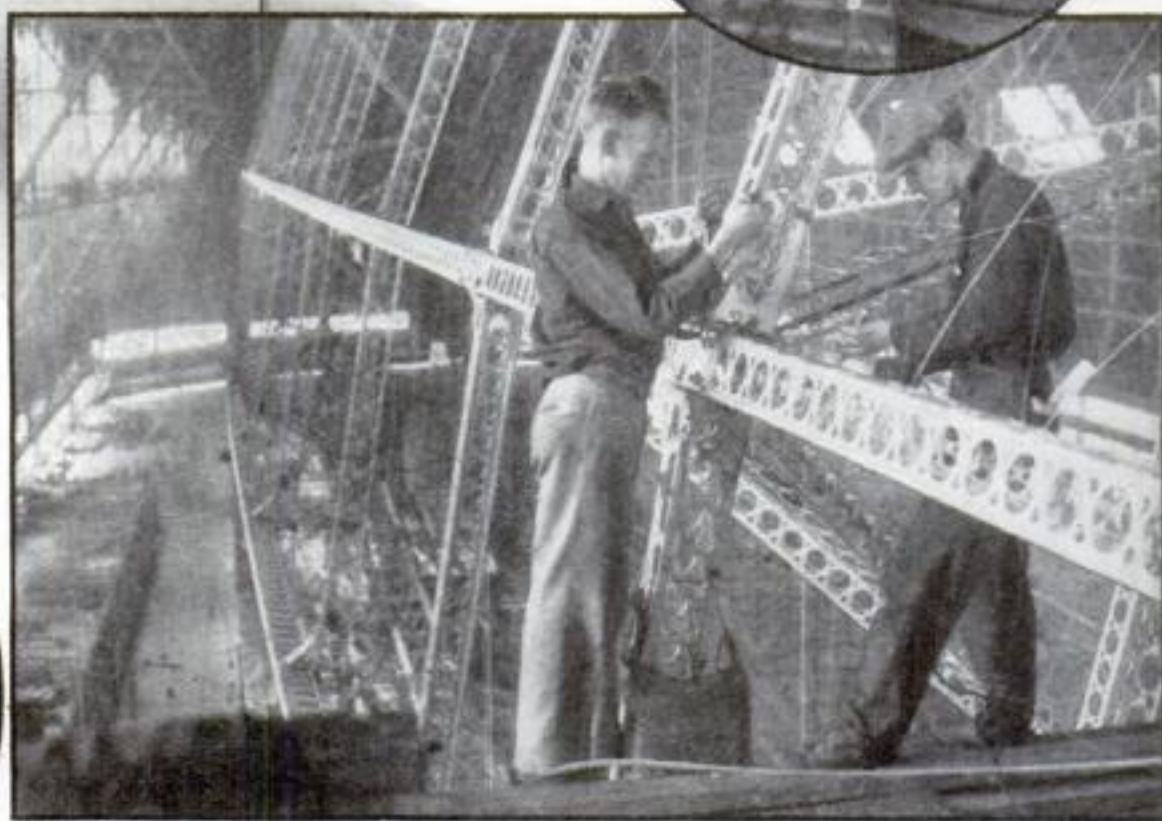
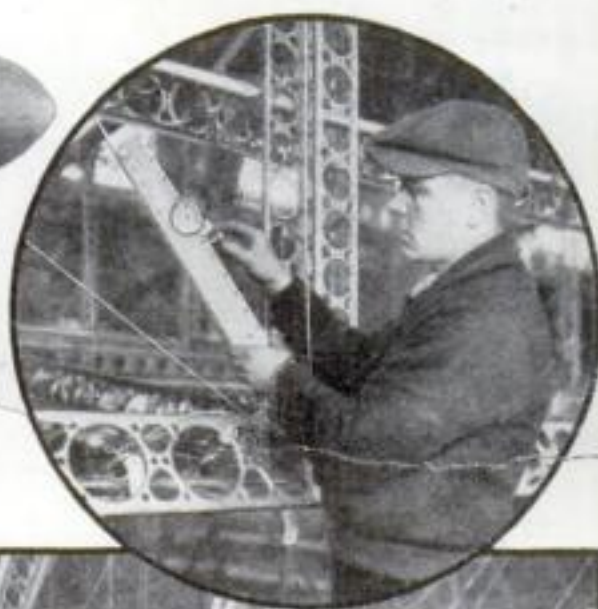
COOLING a motor with soapsuds is being tried in a Detroit, Mich., research laboratory. The suds are sprayed continuously against the underside of the piston, while water flows through hollow exhaust valves of unconventional construction. Tests show that this "super-cooling" brings a marked increase of power.

Guard Secrets of New Airship



Complete in every detail, this model of the *Macon* is constantly studied as the big airship is being built. Photo shows the chief engineer, Dr. Karl Arnstein, pointing to main frame on model

Tension of bracing wires must be just right to prevent sagging or snapping under strain. At right, a special gage is being used to check the tension



In circle, using delicate scales to weigh material before it goes into *Macon*, as ship cannot be weighed when finished. Above, with special tools duralumin rivets are squeezed into place in frame



On the dock floor of the big plant at Akron, Ohio, the tail of the new airship, with a machine gun compartment, was assembled and raised before work started on nose

WHEN the U. S. S. *Macon*, now being built at Akron, Ohio, is finished, it will look like its sister ship, the *Akron*, but it will be different. Many changes, the most important of which are kept secret, will be made in the *Macon*. The gas cells in the *Macon* will be of gelatine-latex construction—a cell type that has been found superior to anything previously used. Its electrical system will differ from that of the *Akron*, as generators of a new type will be used. Its telephone system will be automatic, with phones located at nineteen different stations. Other alterations will be found in the fuel and ballast arrangements and in the control and heating systems. Engine mountings will be lighter and of better design than those now in use, and provisions will be made for replacing the power plant with more powerful engines. In this connection there are indications that a perfected Diesel engine may, in the near future, supplant gasoline motors in airships. Many of the changes in the *Macon* are to reduce the weight, as it will be 8,000 pounds lighter than the *Akron*.

Striking Photos
on These Two
Pages Tell Story
of Work Now
in Progress on
America's New
Giant of the Air



The *Macon's* signaling searchlight weighs only eleven pounds, but it can flash out 300 characters a minute to a distance of 30 miles

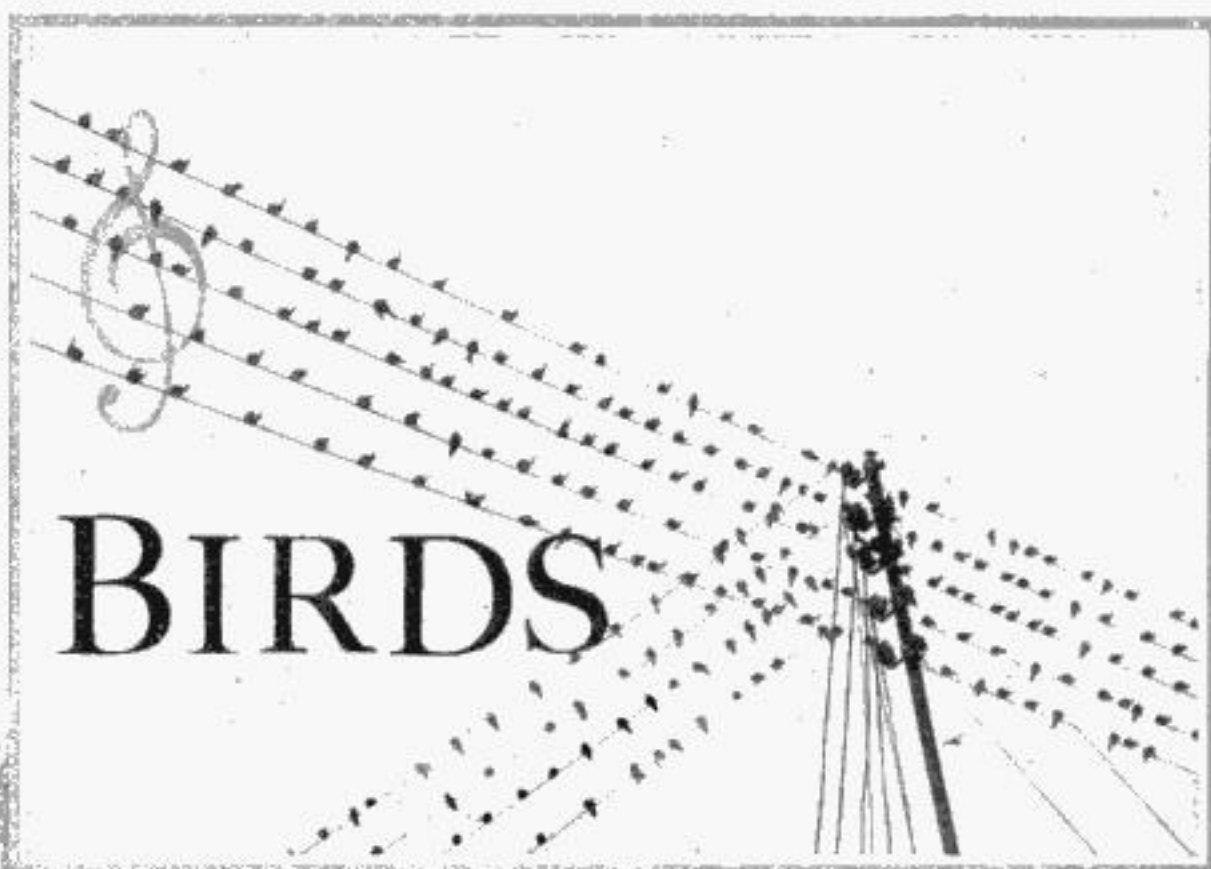
At left, unusual photograph of the framework of the giant airship as it appeared when the job of covering the hull first began. This work, starting on the stern, was carried forward until entire hull was covered



Left, assembling the bamboo frame of the shock-absorbing bumper that will be fastened to the *Macon's* control car. Above, magnifying glasses are used by inspectors in an effort to find imperfections in the pieces of framework that are to go into the hull of the craft

SONG HUNTERS *with* SOUND 'TRUCK

Snare *Notes of* WILD BIRDS



Looking for all the world like notes on a music scale, hundreds of swallows perch on telephone wires and sound equipment records their chirps



This sound truck, in which the song recording apparatus was carried, was stopped at the roadside and the mike placed in the woods to catch the music of the forest singers

AFTER hunting three months through the woods, swamps, and mountains of New York State, A. R. Brand, a retired stock broker and amateur naturalist, recently returned to his home in White Plains, N. Y., with 17,000 feet of talkie film. It was the first scientific collection of bird songs ever gathered.

Riding a special sound truck equipped with microphones, amplifiers, sound camera, and powerful batteries, the song hunter and his assistant stalked the birds during the nesting months of April, May,

and June, when the musical season is at its height in the bird world.

As a result of this expedition, the only library of woodland calls and tunes, containing faithful reproductions of the songs of more than forty birds, has been created. Transferred to phonograph records, they will bring the sounds of the open into the classroom.

Seated at a desk piled high with records of the voices of thrushes, warblers, robins, wrens, and song sparrows, Brand told me about his remarkable work and the reasons that led him to undertake it. A few years ago, he retired from business to devote all of his time to bird study, his hobby since boyhood. Though a middle-aged man, he enrolled as a student in Cornell University, Ithaca, N. Y., and for several terms absorbed bird lore.

At that time, he was struck by the lack of facilities for studying bird songs in the laboratory. True, some experts, in their books, had tried to translate them into musical notes and word-sounds, but these

transcriptions were far from the real thing. The few phonograph records in existence were poor in quality; and all they reproduced was the voices of tame German canaries and English nightingales. Brand decided that the only way to bring the trills, chirpings, and twitterings of wild American birds to students, school children, and nature lovers was to go out and literally hunt them.

A satisfactory experiment in making talking motion pictures of a few birds, conducted at Ithaca by a movie company under the direction of Cornell professors, convinced Brand that here was the right way to do his job. At a cost of several thousand dollars, he had special portable sound equipment made and, accompanied by Peter Keane, an advanced student in the Cornell bird department, set out to put the birds of New York State into the talkies.

Most of the shots were taken in the Fuertes Bird Sanctuary at the head of Lake Cayuga, other parts of central and northern New York, and in the Forest Lake section near White Plains. This, Brand told me, was how it was done:

Close students of bird life know that virtually all birds have favorite song perches. The average bird has two, three, or more of these perches which, during the singing season, it visits daily at about the same time. Through patient observation, the song hunters learned the location of these singing stations. While the birds were away, they camouflaged their microphone, connected by cable to the sound camera, with leaves, branches, or grass, and placed it in the neighborhood of the perch. When the birds returned for another singing session, the songs were recorded on the sound track of ordinary talkie film.

The microphone was concealed anywhere from three to as far as thirty or forty feet from the song perch, depending

Wood Thrush Song
Seventeen thousand feet of film were used to record the songs of over forty varieties of birds



The interior of the sound truck. Bird songs, picked up in the woods, were carried over a cable to be recorded in permanent form on talkie film

FIRST Real Collection of Forest Music Made with Outdoor Microphone and 17,000 Feet of Film

By George H. Dacy

on the variety of bird. If the mike was too close to certain species, jarring blasts of sound were the result. By the trial and error method, Brand learned the proper recording distances for the different singers.

Brand and his assistant usually started work at three A. M. Many city dwellers believe the rooster is the first bird to greet the new day. This is far from true. Certain birds, at the peak of the early summer song season, sing before the first glimmer of dawn. The robins in the northeastern states, for example, begin chirping as early as three-thirty A. M.

Some of Brand's records offer amusing proof that the rooster, as a matter of fact, is a late riser. When they are played, the listener first is entertained by the melodies of a number of songsters. Suddenly, toward the end, the shrill crowing of a rooster brings the concert to a strident close.

Because most of the work had to be done either in the darkness before dawn or in the dim light shortly after, no pictures could be taken, and only sound was recorded on the film. The reason the bird songs, interspersed with expert comment that is inserted later, are transferred to phonograph records, is that most schools and colleges do not possess the projection machinery through which to run off the film itself.

But why did not Brand adopt the seemingly simpler method of making phonograph records in the first place? There were two obstacles. First, while taking phonograph records in the open is possible and has been done, it is extremely difficult to get good results without placing the recorder on a level concrete base to elim-



Long-billed marsh wren ready for mike

inate vibration. Secondly, as bird songs can be taken only on wax records, the process requires the services of at least two expert wax technicians.

A few years ago, when talkies first came into fashion, a number of actors and actresses who had been successful in silent pictures proved to have voices that did not lend themselves to the new method of recording. Some birds, Brand found, are in the same boat. The song sparrow and several types of warblers, for instance, are "flops" in the talkies. Their high-pitched notes, pleasing enough in the open, sound shrill and piercing in reproduction. On the other hand, the thrushes, especially the wood thrush, hermit thrush, and line-backed thrush, make real talkie stars, and the veery, robin, and bluebird also are good performers.

The repertoire of the average bird is limited; in fact, most birds, like radio crooners, have one theme song which they sing from day to day, season after season. Only a few birds are able to change their song. Birds of the same species that inhabit different localities sing a slightly different tune. The song of the New England sparrow, for example, varies a little from that of its cousin in New York State.

In identifying birds by their voices, Brand explained, pitch and quality are even more important than these theme songs. Just as you can distinguish between a tenor and a barytone, so the bird expert knows he is dealing with a thrush or a warbler by the vocal quality of each bird. This individual quality depends on certain



As each bird has a favorite singing perch, the mike would be hidden near by and tuned in for the concert



This reflector was developed to focus the sound waves of the bird songs into the microphone. This permits recording at a distance. Telescope helps line it up with the bird whose song is to be recorded



Here song collector A. R. Brand is placing the mike on top of a post preparatory to making a record as soon as the warbler starts in

overtones of high frequency or pitch.

Aside from their characteristic songs, birds of virtually all species have quite a vocabulary of call notes, the number of which has never been determined. Brand's system of

(Continued on page 94)

Giant Receiver gives



R. A. Fox, manager of Lorain, Ohio, wired entertainment system, working in his studio

By Robert E. Martin

MUSIC that had filled the studio stopped as R. A. Fox, the man who entertains Lorain, Ohio, for eighteen and one-half hours a day, turned a switch. Fox snapped another switch, and began talking into a microphone standing on the desk in front of him:

"Ladies and gentlemen, we're going to bring you the Cleveland-Chicago baseball game as received through station WGN at Chicago. Because of noise and interference, we are going to re-broadcast the program instead of providing a direct hook-up."

He then started a crowd-noise record to provide a suitable background, and proceeded to describe the game as it was played. While Fox was telling about the game, baseball fans in several hundred Lorain homes were grouped around cone-type loudspeakers that stand on three legs. Wires run from these speakers to wall terminals, thence parallel to regular telephone wires to the nearest exchange building. On the back of each speaker is a switch and volume-control knob.

The baseball news that issues from such speakers is but one item on a program that runs from 6:30 in the morning until 1:00 o'clock the next morning. During all of this eighteen-and-one-half-hour period, the listener simply turns the speaker on or off as he pleases. For \$2.50 the wired-entertainment subscriber gets, each month, over twenty-three solid days of music, news, word pictures of local and national events, and occasional novelty programs.

The heart of the Lorain system is a room at the central telephone office. A panel-type amplifier, not unlike that to be seen in any radio broadcasting station or talking-picture house, occupies one corner of the room. It takes audio-frequency cur-

rents that come to it from any of several sources, steps them up, and then feeds them out through a maze of wires to subscribers or to other amplifying panels at the three branch stations. These branches, one at Amherst, seven miles away, and the other two in East and South Lorain, relay programs to individual subscribers.

The amplified sound, at audio frequency, goes out to homes and business places on separate lines. That is, while the regular telephone facilities such as conduits are used, separate cables are laid for entertainment purposes. Of these, nearly three-fourths are underground, so that static and other disturbances usually associated with radio reception, are almost entirely eliminated.

The capacity of the amplifier at the main station is 300 speakers. The East Lorain station serves 200 more, and the

Programs, Retransmitted over Telephone Lines, Go to Loudspeakers in Many Hundreds of Residences



Out of this 22-inch cone speaker, with volume control, comes the relayed radio programs

South Lorain and Amherst exchanges, 100 each. A maximum of four speakers can be operated by each line that goes out from the amplifier. Whenever such a line becomes grounded, a buzzer sounds and a light glows on the switchboard, so that the trouble can be remedied at once.

Although the entertainment generally is selected by operators of the system, a subscriber can have a favorite radio program "put on the wire" by calling the studio at the telephone office at least a half-hour beforehand. Such requests are



Dark-colored wires in this maze are ones that carry music and news to hundreds of subscribers

RADIO *to Whole City* .

SOUND PARTS OF MOTION PICTURES OF PARTICULAR INTEREST ARE USED OCCASIONALLY.



LOCAL EVENTS REPORTED WITH AID OF PORTABLE REMOTE CONTROL EQUIPMENT



RADIO RECEIVING STATIONS PLACED IN OUTLYING DISTRICTS PICK UP CHAIN BROADCAST PROGRAMS AND RELAY THEM BY SPECIAL WIRES TO "CENTRAL"



LOCAL HOTEL BALLROOM DANCE ORCHESTRA FURNISHES MUSIC BY REMOTE PICK-UP



SUBSCRIBERS IN NEAR-BY TOWNS RECEIVE PROGRAMS THROUGH LOCAL SUB-STATIONS BY SPECIAL WIRE



LARGE CONE SPEAKER FURNISHED BY PHONE COMPANY IS THE ONLY APPARATUS NECESSARY IN THE HOME TO RECEIVE PROGRAMS

"CENTRAL" STATION IN LORAIN RECEIVES, AMPLIFIES, AND DISTRIBUTES PROGRAMS BY SPECIAL LINES TO SUB-STATIONS AND NEAR-BY SUBSCRIBERS



SUB-STATIONS IN NEAR-BY COMMUNITIES RECEIVE PROGRAMS THROUGH SPECIAL TRUNK LINES, AMPLIFY SIGNALS, AND SEND THEM TO LOCAL SUBSCRIBERS BY SPECIAL WIRES

Drawing shows clearly the various steps in the operation of the community radio system

not frequent, Fox says, because programs always are made up of features that are known to be popular.

Often Fox is asked why regular telephone wires are not used for carrying programs into homes. This was tried, but found unsatisfactory. Carrier current was super-imposed on the telephone lines at such frequencies that it did not interfere with ordinary conversation. However, the

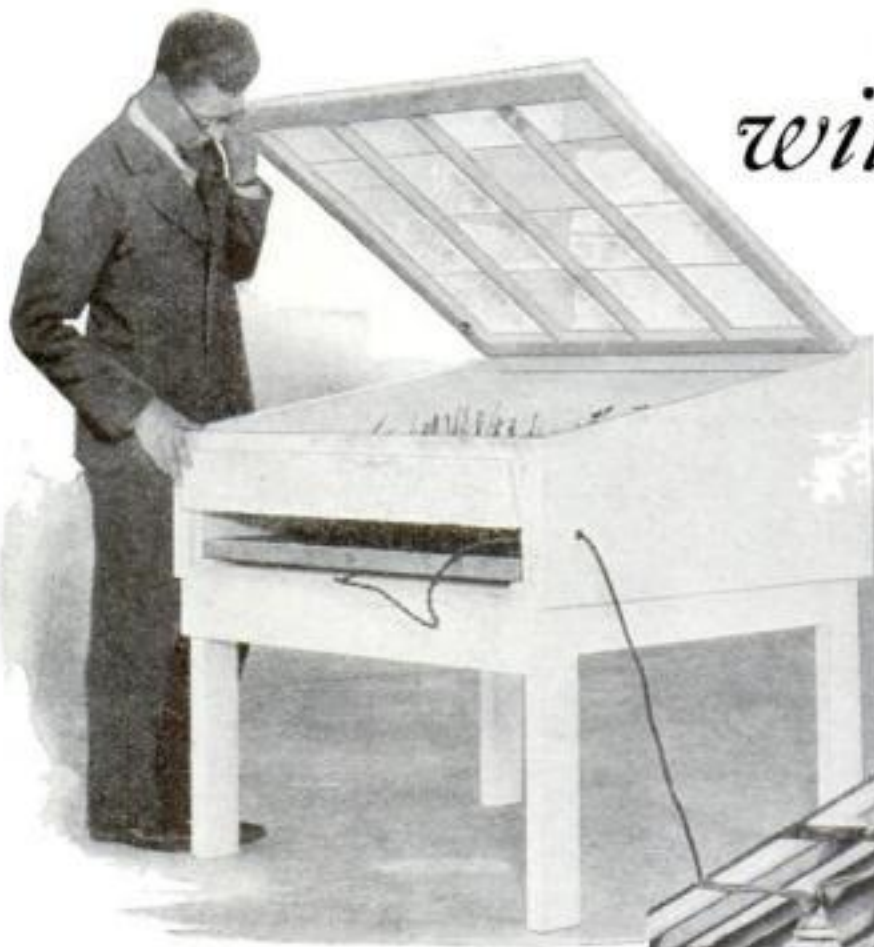
carbon-grain microphone that forms the sound-converting part of each telephone transmitter persisted in acting as a detector, rectifying radio-frequency currents and making programs audible through the telephone receiver. Of course, this played havoc with regular service. An investigation revealed that the trouble could be overcome by installing choke coils in each telephone box, and making other changes;

but the cost would have been prohibitive.

The system now in use, which consists essentially of a giant radio receiving set with hundreds of loudspeakers scattered over several square miles of territory, has been found satisfactory. The all-day-long entertainment for the price of a telephone has proved popular with those who do not want to be bothered with a complete radio receiver, or dislike paying for one.

GARDENERS WORK MIRACLES

with Electric Hotbeds



This electric hotbed uses a 300-watt unit. It can be placed on porch or in yard and used for raising winter vegetables.

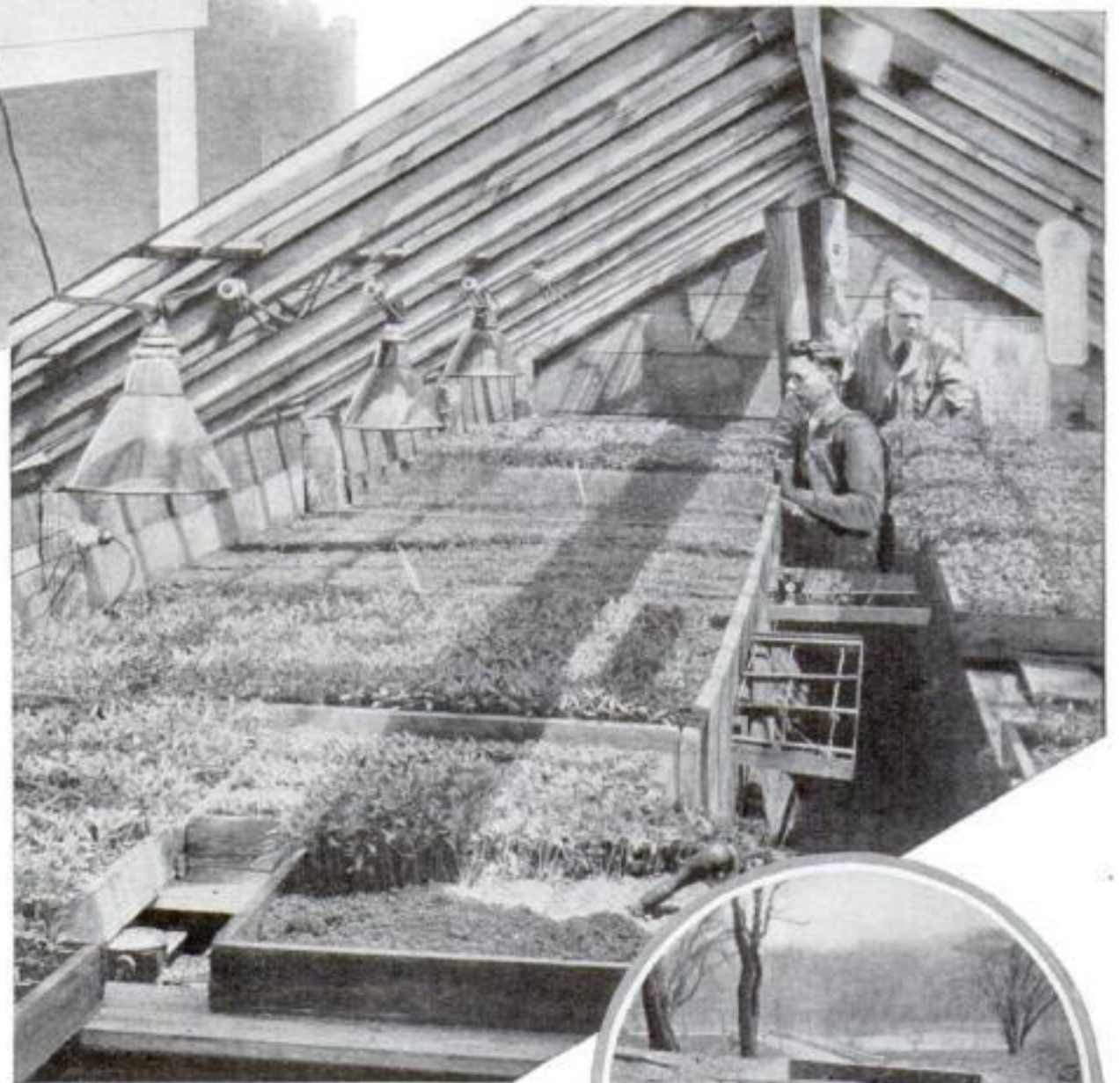
By Walter E. Burton

AN OVERLOADED electric power cable in Norway may seem to be far removed from American gardens. Nevertheless, that particular cable was the means of putting thousands of dollars into the pockets of American gardeners.

A few years ago a Norwegian engineer named Jacobsen noticed that plants growing above an underground transmission line were larger and better developed than those a short distance away. Instead of attributing the result to some unusual effect of electric waves, Jacobsen reasoned that the healthier plants received more heat through the ground. Investigating, he found the cable was carrying more current than it was designed to handle, and that this overload was making the cable hot.

The plants, then, were being speeded up by an electric "footpad." It was not long until plant growers all over Norway and Sweden were devising ways of heating their crops electrically. The practice, spreading to central Europe, at last reached America. Today, millions of kilowatts are fed each year to American cabbage, lettuce, phlox, radishes, celery, azaleas, tomatoes, and dozens of other flowers, vegetables, and tree seedlings.

A western grower of rhododendrons had been planting seeds in old-fashioned manure-heated hotbeds and cold-frames, and something like forty percent of these seeds grew into salable plants. After he installed electric hotbeds, the percentage jumped to ninety and one hundred. This increase of more than 100 percent would be worth while with almost any crop, but it was doubly so in this case, as rare

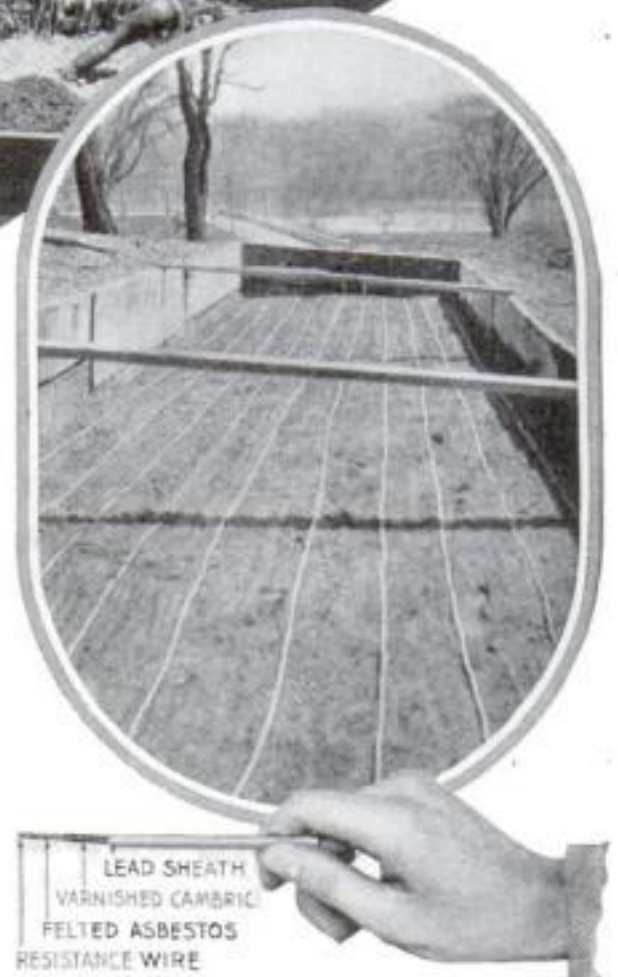


Three electric units are used under the beds in this greenhouse, which is on the farm of E. W. Woods, Connellsville, Pa. With them 20,000 cabbage plants were started at a cost of about five cents per hundred plants. Note frame with wire extending at end of the bed.

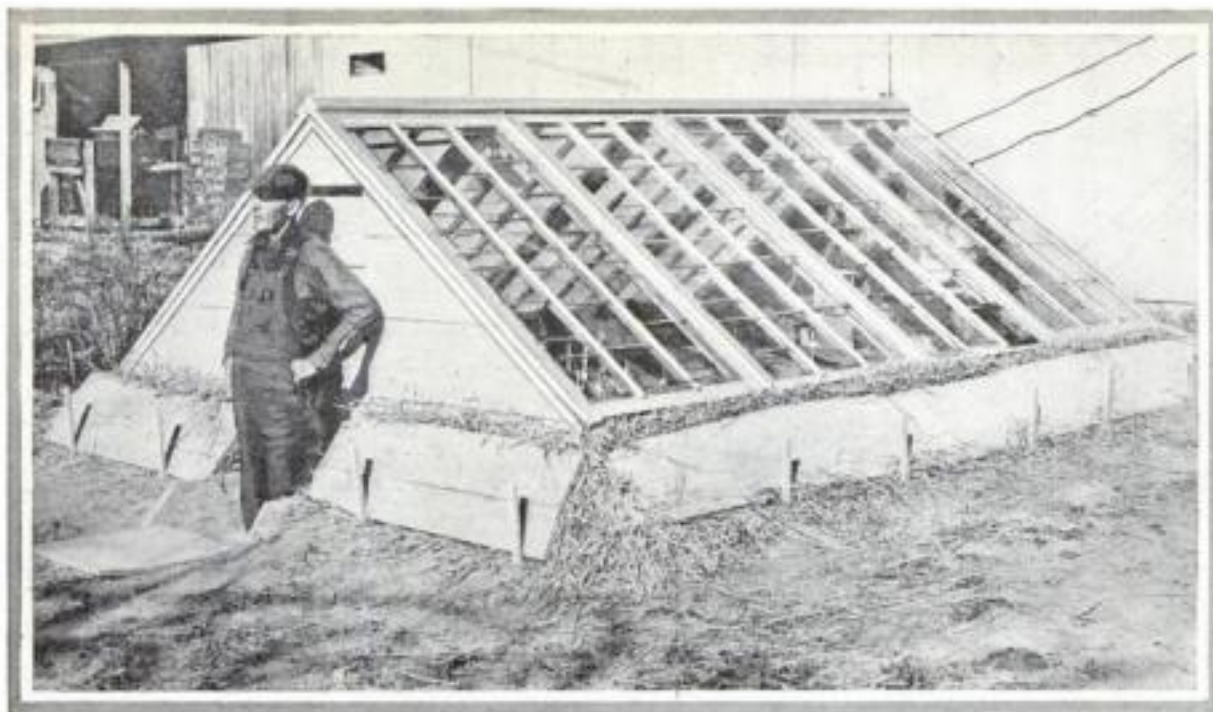
rhododendron seed costs \$100 an ounce! Furthermore, by planting azalea seeds in February, the same grower raised plants electrically that could be transplanted in May, saving a whole year's time.

Hotbeds, cold-frames, greenhouse propagating benches, greenhouses themselves, and even open garden plots now are being heated by electricity. Although the process is being adopted by professional greenhouse owners and other large scale producers, the same equipment can be used by anyone who has a little space to spare and who delights in eating lettuce and radishes picked from his own garden in January, or in having big, vigorous tomato plants to set out in the spring.

Hotbeds have been in use almost as long as garden vegetables have been grown.



Picture shows construction of lead-covered cable for electric hotbed. In oval, these heating cables are seen installed in hotbed before being covered with six inches of soil.



At left, outdoor plant house electrically heated at about the same cost as steam heat. Note straw banking used to conserve heat and cut cost. Below, inserting a thermostat in soil. About two inches project

Heat Controlled Automatically Gives Plants Fast Growth and Unusual Size



Above, thermostat that can be set to maintain any desired temperature between fifty and one hundred degrees above zero. At far right, celery twenty-six days old grown in electrically heated hotbed. At its left, celery, same age, grown in manure bed



For centuries, manure was the standard heat-producing material. However, manure is becoming scarce and costly. So it is natural that artificial heat should be tried. Of the various possible forms, including steam, hot water, and electricity, the latter has triumphed because of its cleanliness, flexibility, and simplicity of equipment.

A hotbed is a shallow box covered with glass and provided with heat. When manure is used, it ferments and produces chemical heat for a period ranging from four to six weeks. Temperature cannot be controlled. But with electricity, the temperature remains indefinitely at the desired level.

There are numerous makes of heating units and heating systems available to the hotbed owner, but there are only two general types that have proved outstanding. One of these is an automatic heater that resembles the elements in an electric oven. In a typical unit, resistance wire of nickel-chromium alloy is wound into the form of a coil spring, and is stretched back and forth across a metal frame, the wire passing through washers of insulating material. In the center is a thermostat control that snaps on when the temperature drops below a certain point, and snaps off again when the temperature rises. The thermostat is adjustable.

This particular unit measures thirty-two by thirty-two by three and one-half inches, and is used below the hotbed, being slipped into a compartment constructed to receive it. The heater is designed for use on a 110-volt line, either A. C. or D. C., and the unit is rated at 300 watts.

In hotbeds for this unit, the soil layer rests on a wire screen or a corrugated iron surface, permitting the heat to move upward into the soil. In a series of hot-

beds, temperatures in different beds can be varied to accommodate different crops, as each heating unit can be set for a desired temperature level simply by turning a knob.

One open coil type heater is satisfactory for a bed three and one-half by six feet, or even larger in some localities. Climatic conditions determine to a considerable extent the size of bed that can be heated efficiently.

Another type of hotbed heater consists of a length of special resistance cable buried beneath the soil. This cable is made up of resistance wire covered by a layer of asbestos and cambric or other insulating materials, and sheathed by lead. It is flexible and durable enough to last underground for years. Some cables are rated at 400 watts for each sixty feet of wire. Others have different characteristics.

Although the cable can be turned on or off by hand, it has been found more economical to use a thermostat. The sensitive element of the thermostat is buried in the ground with two inches projecting above the surface, so that it is affected by both soil and air temperatures.

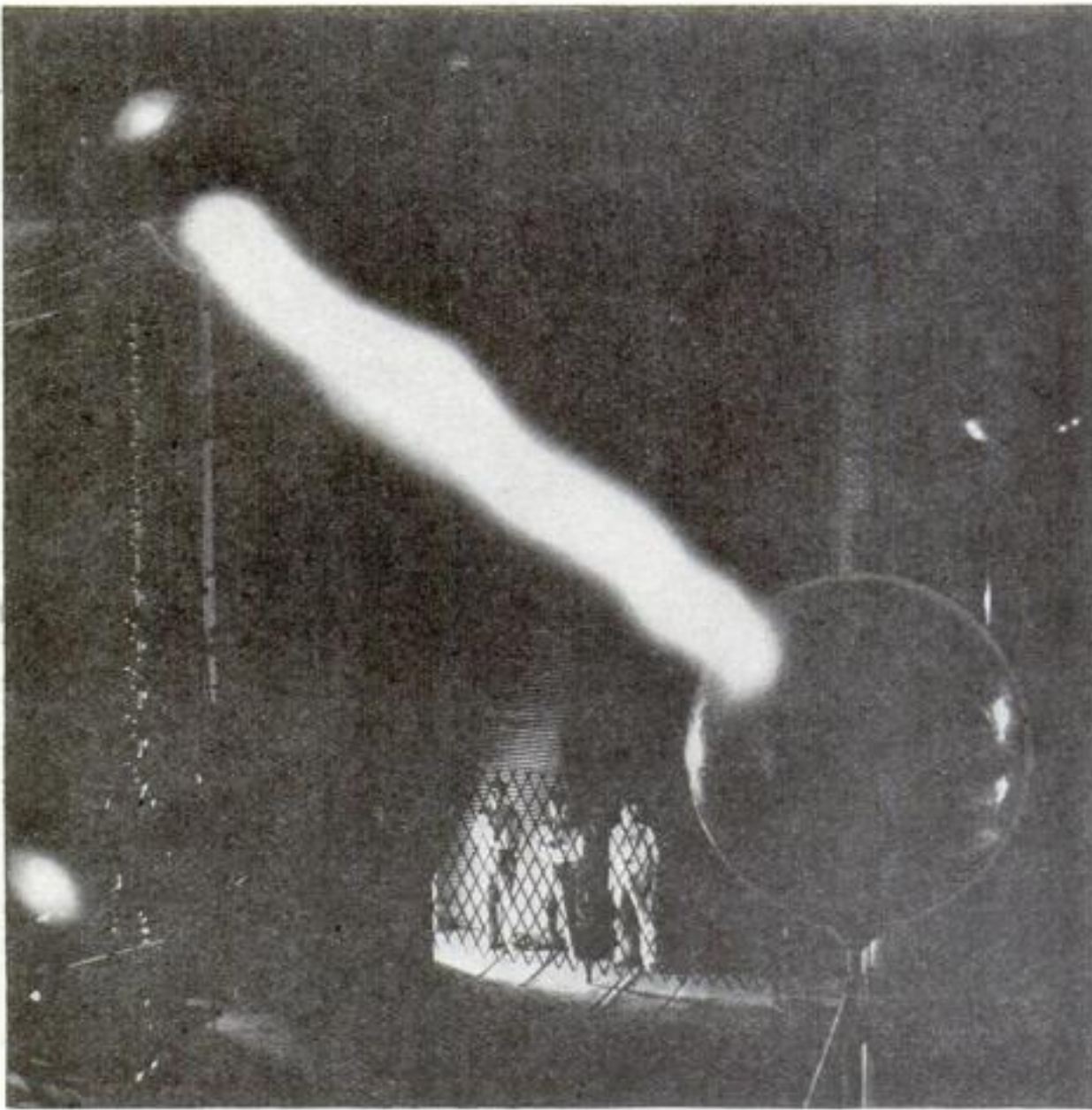
A 400-watt cable is sufficient for a six by six foot bed. Dig a pit about fifteen inches deep and one and one-half feet longer and wider than the bed frame. Place an eight-inch layer of cinders or other

insulating material over the bottom, and then set the frame in the center and fill around with cinders. Spread an inch of dirt over the cinders inside the bed, and run the cable back and forth across this, spacing the strands about seven inches apart. Then put another inch of dirt, followed by a sheet of screen wire, metal lath, or similar material over the cable, and on top of this spread five or six inches of top soil. The screen is to prevent damage to the cable when top soil is worked or changed. Bank the hotbed with earth, and make all joints windproof.

Cable can be used outdoors with gratifying results. A Japanese gardener in California wired a one-tenth-acre cucumber bed with copper cable by stretching it under the rows, at a depth of eight inches. Another bed of equal size but without wires was planted. In forty-one days the heated crop was ready for market. A total of 2,400 kilowatt hours of electricity, costing \$40, was used. Original installation had cost \$100, so that the grower spent \$140 for his electric heat that season. However, by getting twice the normal number of cucumbers, and getting them earlier, he realized \$300 profit from the wired plot, while the unheated cucumber return was only \$150.

A Michigan farmer germinated 2,000,000 tomato *(Continued on page 96)*

Ten-Million-Volt Thunderbolt Launched in Electric Laboratory



Ten million volts of electricity, more than twice the voltage ever before secured by man, leaped between aluminum balls to produce this brilliant thirty-foot spark, used in a study of lightning

THUNDERBOLTS of ten million volts of electric fire crashed between two six-foot aluminum spheres in the General Electric Company's high-voltage laboratory at Pittsfield, Mass., the other day, their noise resounding through the steel-lined room. Produced by a new 50,000,000-kilowatt generator, the mighty sparks possessed twice the voltage ever before attained by man. While thirty-foot sparks were obtained in the tests, such a voltage will project an arc of sixty feet if space allows. The artificial thunderbolts of unprecedented power will be used by engineers in a study of the effects of natural lightning upon electric transmission lines and generating apparatus.

CAR'S LIGHTED SIGN WARNS OF TURN

IMPOSSIBLE to misunderstand is a stop and turn signal for autos, that informs a following motorist in spelled-out words what the driver is going to do. The disappearing sign contains an electric light connected to the car battery, which turns on and off automatically as the signal is operated. To signal a right or left turn, the driver moves a handle to right or left as shown in the photograph, and then pushes it straight up, opening a valve that ex-

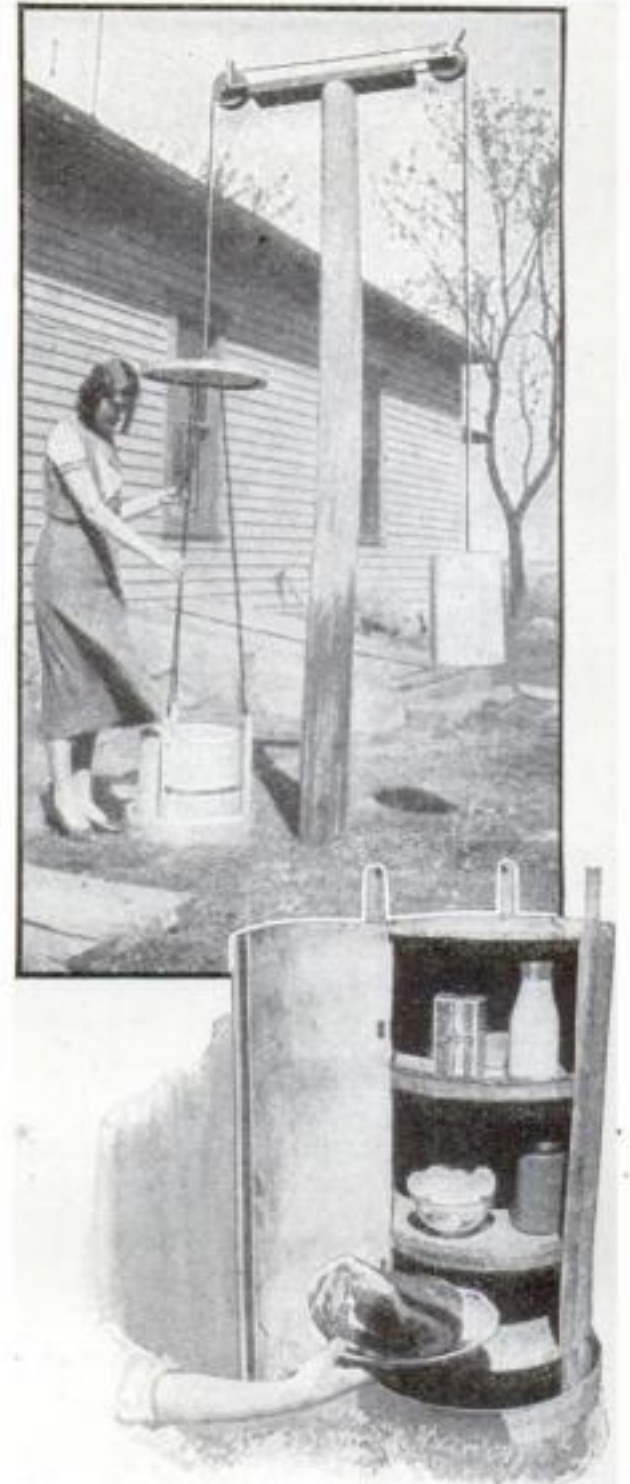


tends the sign beyond the edge of the car. By reversing the process it is withdrawn, vacuum from engine furnishing power.

GLASS BLACKBOARD REPLACES SLATE



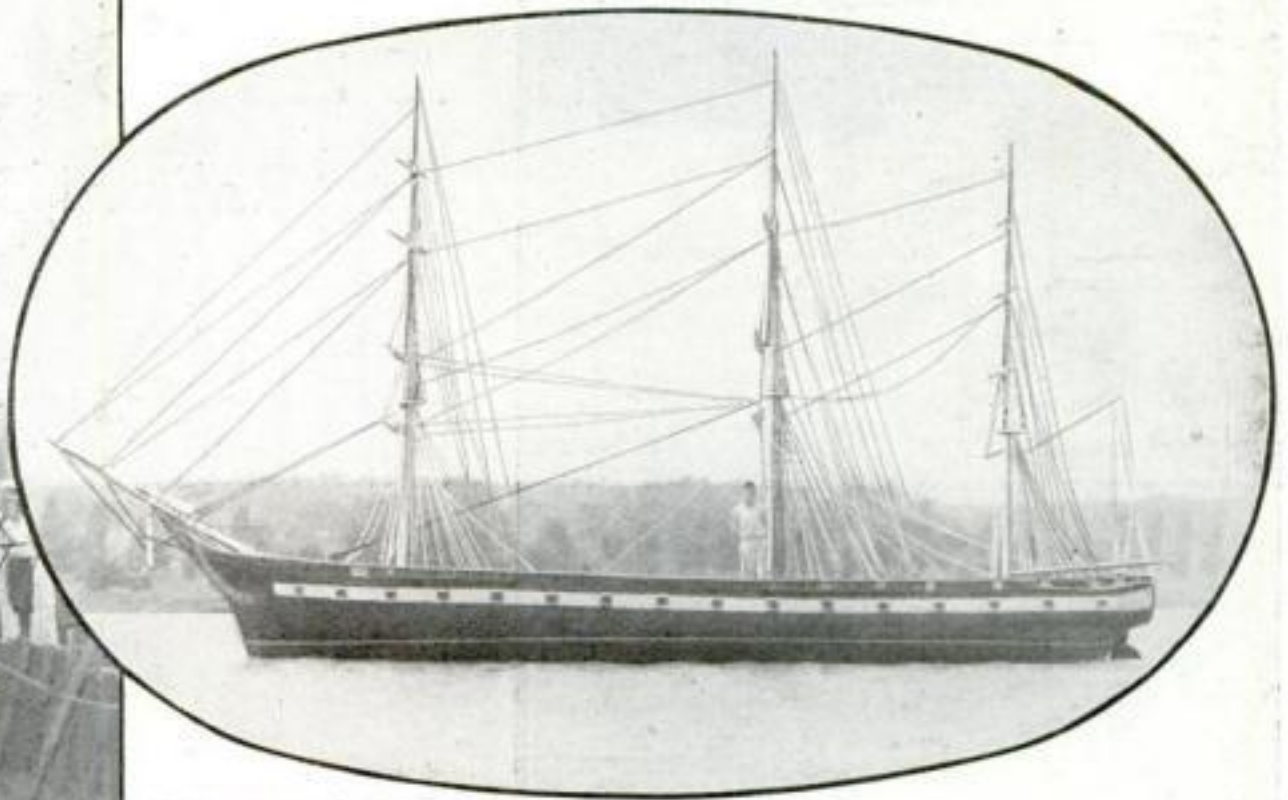
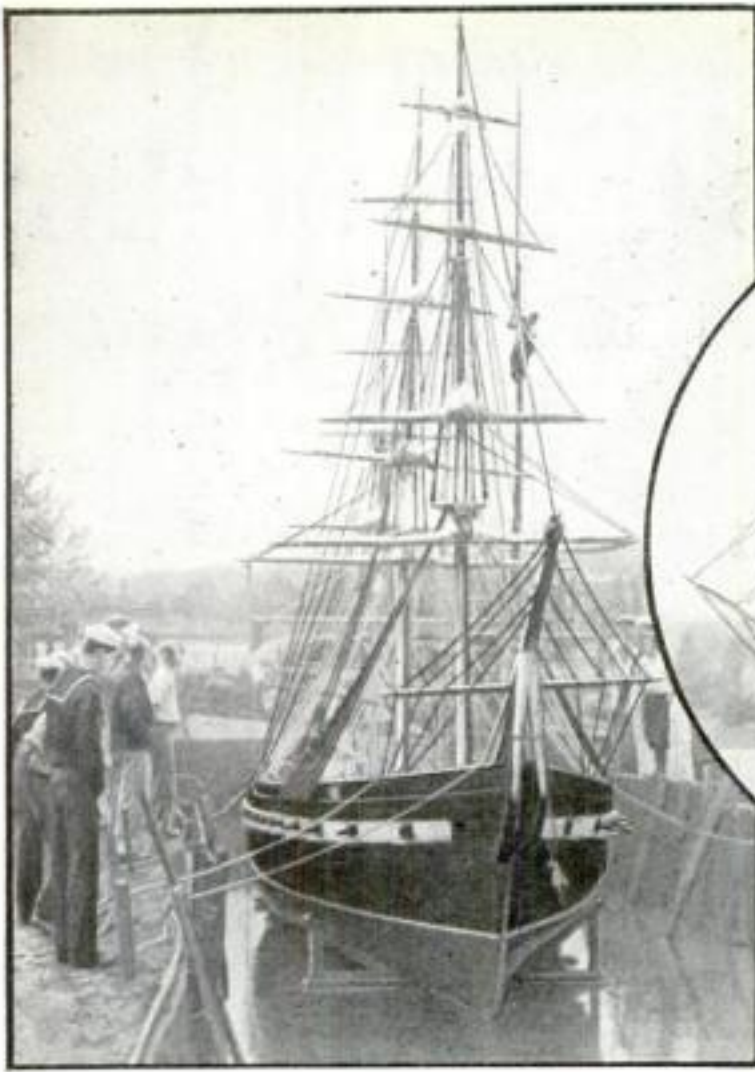
GLASS blackboards are the newest style for schoolrooms. Designed to replace slate, they are said to be unscratchable and not subject to fading. By a new process a rich black color all the way through is given to the glass. The panes have approximately the same weight as similar areas of slate, with none of the defects often found in slate.



UNDERGROUND CHAMBER KEEPS FOOD FRESH

TO KEEP food cool and fresh without ice, an inventor of Garvin, Minn., devised an underground "refrigerator." The food container is a cylindrical cabinet fifteen inches in diameter and thirty inches high, fitted with three shelves, and closed by a hinged door. It is lowered on a cable nearly to the bottom of a hole seven feet deep, where it is held in position by a counterweight. A touch upon the cable, which passes over two pulleys, raises the cabinet for filling or emptying.

BOY SCOUT SAILORS TO TRAIN ON TINY "OLD IRONSIDES"



Two views of the *Constitution Junior*, the forty-seven-foot reproduction of "Old Ironsides." On this full-rigger, boy scouts will be trained in handling a sailing ship

A COUNTERPART in miniature of the famous frigate *Constitution* and probably the smallest full-rigged ship afloat, the *Constitution Junior* was recently launched at Washington, D. C. The little vessel, forty-seven feet in length, is to be used as a training ship for the local troop of Sea Scouts—the nautical branch of the Boy Scouts of America. It is expected to make most of its cruises under sail alone, affording the boys experience in handling sailing craft. The *Constitution*

Junior is a faithful copy of "Old Ironsides," even to the tiny guns that protrude from its ports. The basis of the new craft was an old Navy motor launch sold at public auction. To this were added masts, rigging, and sails constructed entirely by hand. The result is a craft sufficiently seaworthy to cross the ocean, if need be.

The miniature *Constitution* is the work of a Washington shipbuilder who is also a veteran of the sailing ship days in the

Navy. The cooperation of naval officials was enlisted and some of the parts for the *Constitution Junior* were manufactured at the Washington Navy Yard. In keeping with an old naval tradition, all the guns for the little vessel were made in the same Navy Yard shops where the guns intended for actual use in warfare are manufactured. The vessel was launched at a ceremony attended by officers of the Navy and prominent civilians. During the summertime when it is not in use, the *Constitution Junior* will be tied up alongside the original *Constitution*, now in Washington, so that a comparison of the two vessels may be readily made.

SALESMAN'S CAR EXPANDS AS SHOWROOM



AN EXPANDING automobile has been introduced to meet the needs of traveling salesmen. When the driver reaches a place where he wishes to demonstrate his merchandise, he stops the car, inserts a crank-shaped lever in a floor socket beside the gear-shift handle, and gives it a few turns. The top and sides of the car move outward on sliding racks to form a spacious showroom where prospective customers may be received. By reversing the process the car is closed again for traveling. Designers of the car say its use increases sales by making it easy to show goods.



Above, salesman's expanding auto, and at left the car with sides extended. Upper left, view of interior of car when in use as showroom



The lamp shown at left clamps to the underside of the bed so light is shielded from sleeper

SLEEPER NOT DISTURBED BY LAMP UNDER BED

TO MAKE it possible for a person to move about a room where another is sleeping, without disturbing the sleeper or bumping into furniture, an ingenious under-the-bed night lamp has been placed on the market. When the lamp is clamped to the bed frame, its direct rays are shielded from the occupant but cast a soft glow over the entire floor space. It provides a useful aid in caring for young children at night or for persons retiring after another occupant of the room is asleep.

Electrically Operated Machine Parks Cars *in Air* *to Relieve Congestion in Streets*



Vertical parking in the first commercially operated "up-in-the-air" garage. This machine, now in use in Chicago, accommodates forty-eight autos

VERTICAL parking, newest way to keep cars off busy city streets, has come into its own. After six months' successful trial of the first commercial installation of the system in the loop district of Chicago, others are now contemplated for other large cities.

Should you wish to park your car for only a few hours, under the new system, you drive to a "transient" parking tower that resembles a flattened Ferris wheel. Twenty-four cradles revolve on endless chains, many of them occupied by cars. One of the cradles, empty, faces you at the entrance. You drive upon it, set your brakes, and step from the car. On leaving, you press a hand lever. Out of a slot comes a ticket for your car; it bears the number of the cradle and the time of parking. Meanwhile the doors automatically swing closed upon the cradle, the Ferris wheel revolves, and the reopening doors disclose an empty cradle for the next customer.

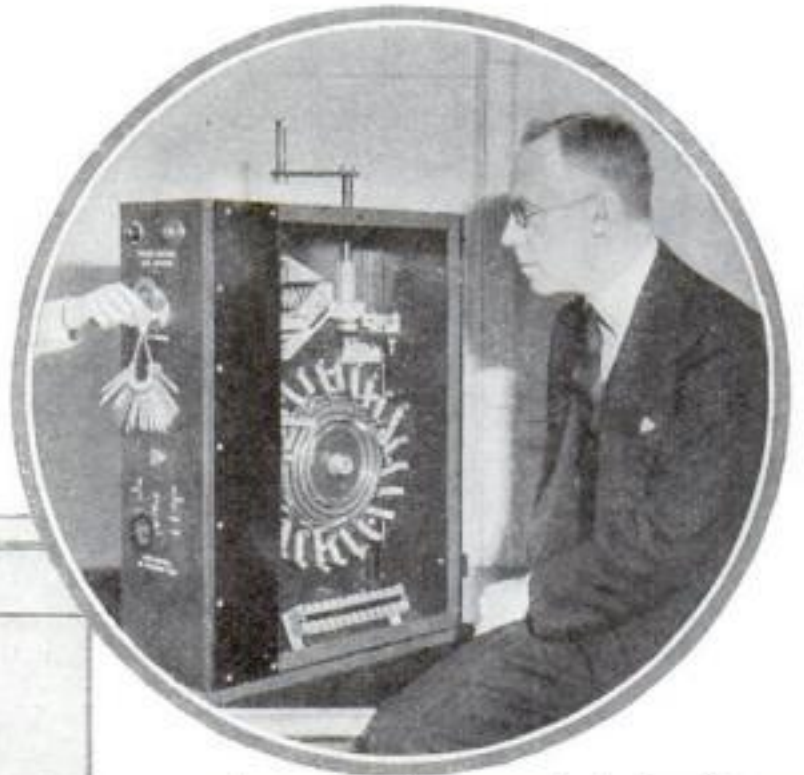
To reclaim a car, you present your slip, together with the parking fee, to the cashier. He turns to a small control panel and pushes a button corresponding to the number on the slip. By the time you have stepped to the doorway of the parking machine, your car awaits you.

Another type of vertical parking tower is designed for the permanent use of regular patrons. In this plan, each car owner

receives and keeps a key to his own parking cradle. The result is an "automat" garage with no need of service from employees. A patron calls for his car simply by inserting his key in the master keyhole of an ingenious electrical lock and giving it a turn. This starts machinery that operates the Ferris wheel, automatically bringing his car down to the entrance by the shortest route. No one has access to the car but the owner, preventing tampering or the theft of small articles. Since each automobile has its individual cradle, there is no chance of bumping or scraping other cars.

Simple as is the new system in operation, it required the most elab-

A regular patron of a vertical parking tower gets his own car by inserting a key in the ingenious electric lock seen at right. Below, diagram shows how dozens of cars can be parked vertically in the space required by three

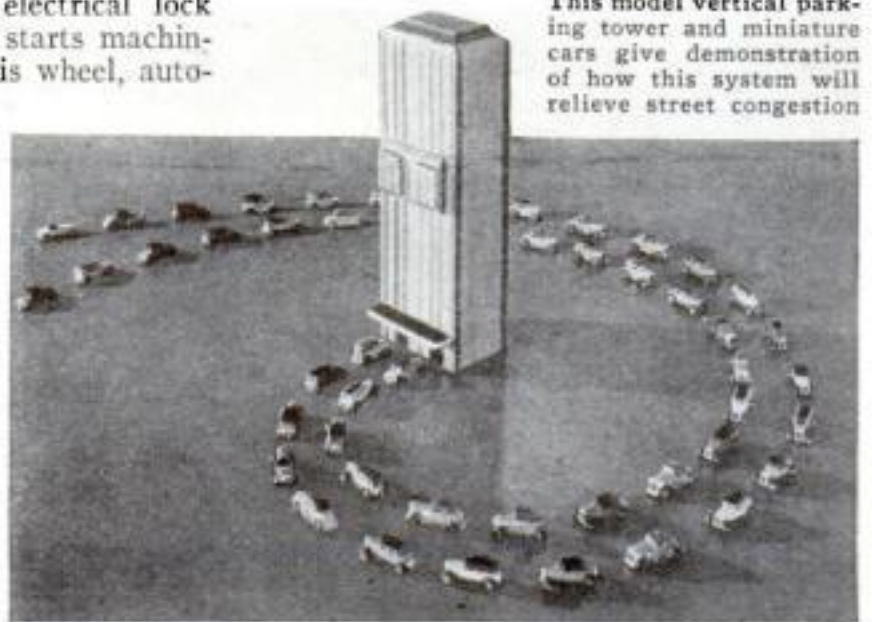


orate engineering research before it was eventually perfected by engineers of the Westinghouse Electric and Manufacturing Company. They built and tested several experimental parking machines at East Pittsburgh, Pa., before the first commercial model, a two-unit tower, was ready for installation on a Chicago lot.

Though the Chicago installation occupies a ground area of only thirty-two by twenty-four feet, it accommodates forty-eight cars. It is 105 feet high and made entirely of steel. A seventy-five-horsepower motor supplies all the power necessary to turn the endless chains on which the cradles hang. On the average, it takes one minute to deliver a car.

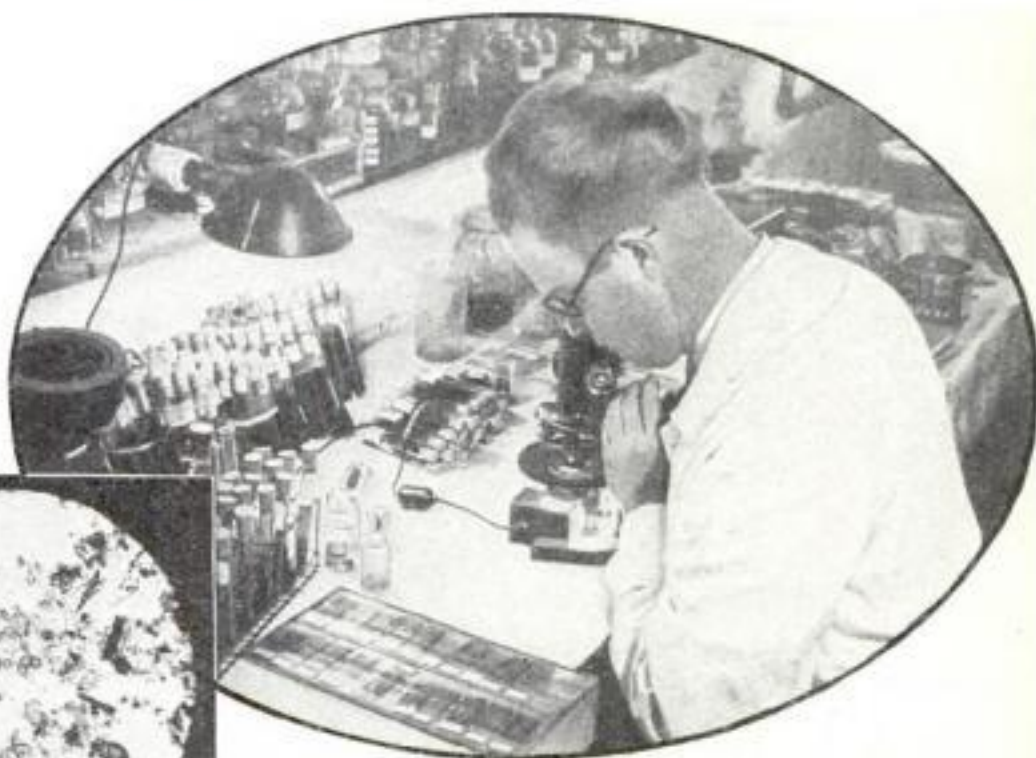
Officials of other cities have watched the experiment with interest, since the new system is at its best in restricted space. The machines may be installed in unused alleys or made a part of existing buildings used for other purposes. Either above-ground or underground installations are practical. There is no ventilation problem since a car is not run under its own power.

This model vertical parking tower and miniature cars give demonstration of how this system will relieve street congestion



Climate 25,000 Years Ago Traced in Ancient Tree Pollen

FROM a study of the pollen of ancient trees, a "pre-historic weather man," John Voss, high school instructor of Peoria, Ill., has traced successfully the climate of his locality for the past 25,000 years. Illinois and Wisconsin peat bogs, he discovered, contain quantities of perfectly preserved pollen from trees that long since disappeared. Under the microscope this pollen is easily identified as from birches, firs, pines, elms, or other species. Knowing the approximate age of each peat layer from which the sample came, Voss can tell how long ago a given kind of tree grew there, and this in turn supplies a clue to the climate. The last 250-century period, he says, was first cool and dry; then warm and moist; next warm but dry; and finally cool and moist at the beginning of our present temperate climate. An ingenious drill with a self-closing chamber for collecting samples is used by Voss, who calls this method of delving into past weather "pollen statistics."



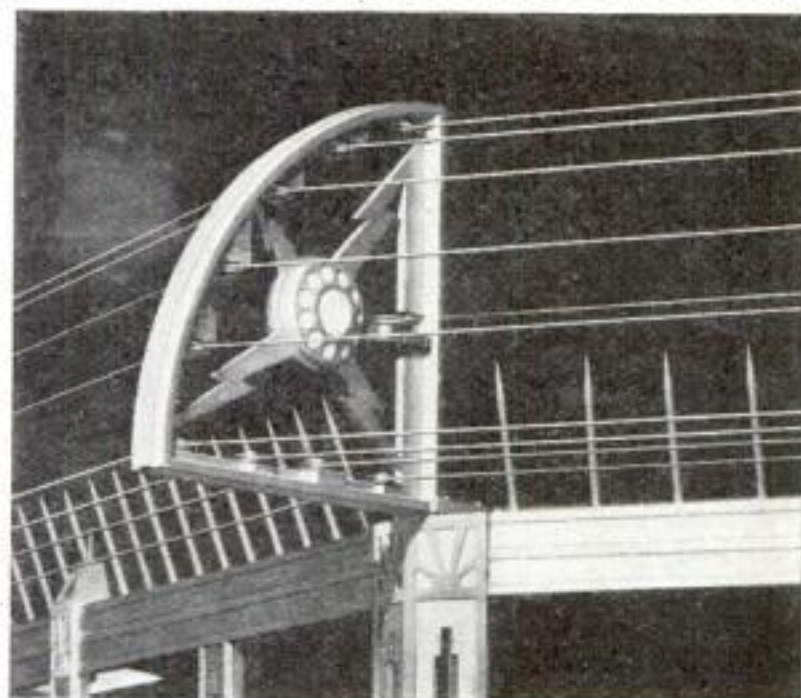
John Voss, prehistoric weather man of Peoria, Ill., examines fossil pollen specimen, seen at left, beneath his microscope to determine the climate this country had 25,000 years ago



Boring into a peat bog with a self-closing drill to get pollen of trees dead many centuries ago

BANK ALARM CAN ELECTROCUTE BANDIT

BOLD indeed would be the bandit who attempted to climb over a new protective barrier for the grating of a bank cashier's cage. To succeed, he must pass a dozen parallel strands of fine steel wire strung on quadrant-shaped standards. Touching any one of ten of them will set off a loud alarm outside the building. The other two are so connected that, if displaced in the least, they become charged with 15,000 volts of electricity—enough to discourage the most determined thug. Dummy microphones within the standards are merely decorative



Tests with this dummy policeman, whose warning finger points to a "no parking" sign, show motorists will heed his silent gesture more readily than they will the sign standing alone on curb

SCARECROW COP MAKES DRIVERS OBEY RULES

DUMMY traffic cops are a new warning to motorists. Though a driver might fail to see or heed an ordinary "no parking" sign, the admonishing finger of the stern-faced dummy serves as a forceful reminder that the sign means what it says. A trial of the figure showed that few drivers chose to risk a summons by ignoring it, with the result that the regular police force is largely freed from the task of rounding up offenders.

USE BLACK LIGHT TO GET UNUSUAL COLORS

HITHERTO unforeseen artistic effects with materials that glow in characteristic colors when illuminated with ultra-violet light are predicted by American dye experts. Window displays, arranged of fabrics treated with fluorescent dyes and show cards lettered with fluorescent ink, will give a striking effect when illuminated with ultra-violet rays. Tests have already been made with stage settings.

GERMANY QUARANTINES ALL IMPORTED ART OBJECTS



Objects of art, arriving in Germany from America, are put in disinfecting chambers where they are kept until all pests and mold have been destroyed

Employees of the Berlin Museum of Art wear gas masks when handling the newly imported objects of art, which are fumigated before they are exhibited



TO PROTECT its museum treasures against destructive insect pests and mold, Germany has established the world's only quarantine for art objects. Imported pieces

from America, Africa, Australia, and Asia must be fumigated before they are admitted into the country. Government workmen wearing masks to protect them-

selves from the poisonous gases present a strange appearance as they place curios in the fumigating tanks, as shown in the accompanying photographs.

TWO-FACED INSTRUMENT IS VIOLIN OR VIOLA

TWO-FACED is a novel instrument devised by a St. Louis, Mo., musician. One side is a violin, the other a viola. By reversing the instrument from time to time, a skillful performer can execute an exceptional range of chords of high and low pitch. Using only one side at a time, a musician has at his command either the violin or viola part in the score of a composition. The new instrument has two bridges and two sets of strings and tuning pegs, but only one sounding box.



UMBRELLA ON BICYCLE SHELTERS RIDER

SHOULD he get caught in a shower, a Bavarian inventor, Heinrich Rothbauer, has no concern. A sturdy umbrella is mounted on his bicycle, attached by a clamp in such a way that it may be adjusted to the most effective angle. The umbrella can also be used to shade the rider from a hot sun. The innovation has been placed on the market and other cyclists are now availing themselves of the product of the Bavarian's ingenuity.

UPPER BERTH TRAVELERS GET DRESSING PLATFORM

AN INNOVATION in railroad travel called a "dressing platform" has been put into service for upper-berth passengers by the Michigan Central Railroad. This folding platform provides comfortably roomy space to dress, replacing the usual cramped quarters. Built into it is a hinged ladder that folds flat against the compartment when not in use, permitting other passengers to pass readily through the corridor. The photograph below shows a passenger descending by means of the ladder after dressing in the compartment above it.



Split Film Cuts Home Movie Cost



Index finger of left hand easily works release button on new camera. Finder is part of handle

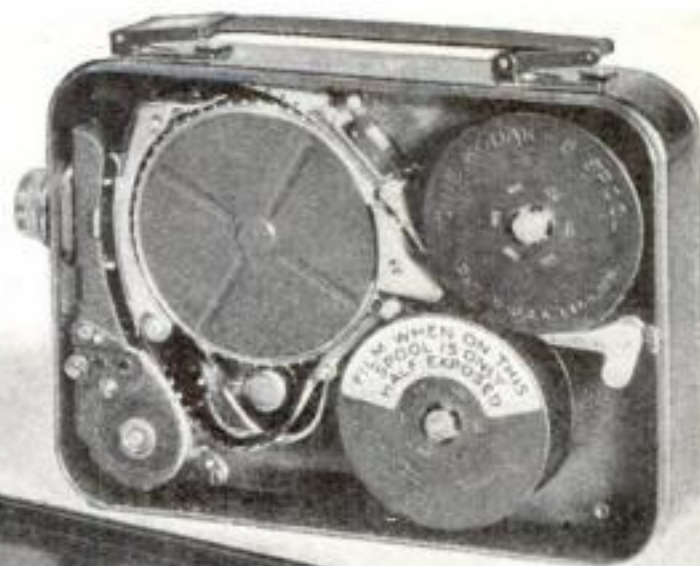
FOUR pictures are squeezed into the usual film space of one, through the use of a camera of radical design in a remarkable "narrow gage" movie system just introduced. So economical of film is the process, according to its sponsors, that thousands who have thought home movie-making beyond their means may now enjoy this fascinating hobby.

A special type of amateur movie film sixteen-millimeters wide, with double the usual number of perforations, is used in the new camera. The lens, however, is offset so that only half the width of the film is exposed on a single run of the film. Then the photographer removes the film spools and reverses them, allowing the other half of the emulsion to pass under the tiny lens. Since the lens forms images of only half the usual length and width, the lengthwise capacity of the film is also doubled. Thus the standard twenty-five-foot roll of the new film will record action that ordinarily would fill a hundred feet of film.

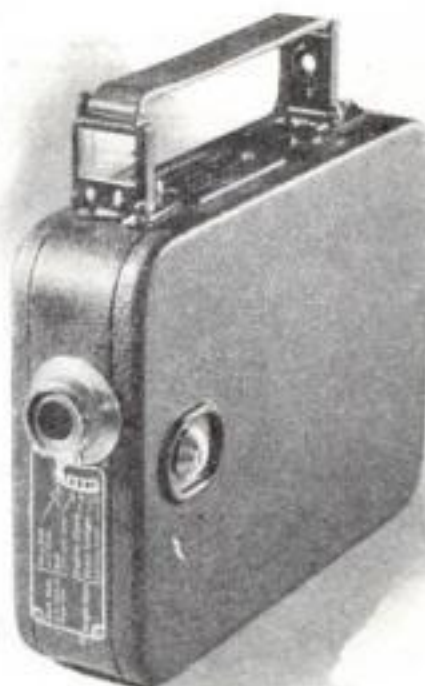
When an exposed roll is sent to the finishing laboratory, experts first develop and reverse it to form a positive in the ordinary way. Then the film, split lengthwise, separating the two rows of pictures, is spliced to form a single fifty-foot ribbon of eight-millimeter film. Finally the film is wound on a special "narrow-gage" reel. Displayed with one of the new projectors designed to handle the narrow film, the images may be thrown upon a fair-sized screen.

Other advantages besides economy are inherent in the "narrow-gage" movie system. The F/3.5 anastigmat lens, operating at half the usual focal length, gives simultaneously clear images of near and far objects. This eliminates all need of focusing, and makes operation practically as simple as that of a box camera. The picture-taker need only wind the spring motor, set a diaphragm opening according to the brightness of the

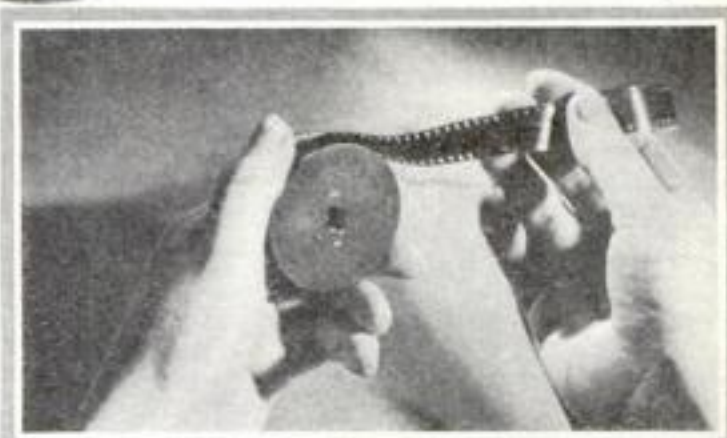
Remarkable Narrow Gage System Squeezes Four Images into the Space Which Formerly Was Needed for One



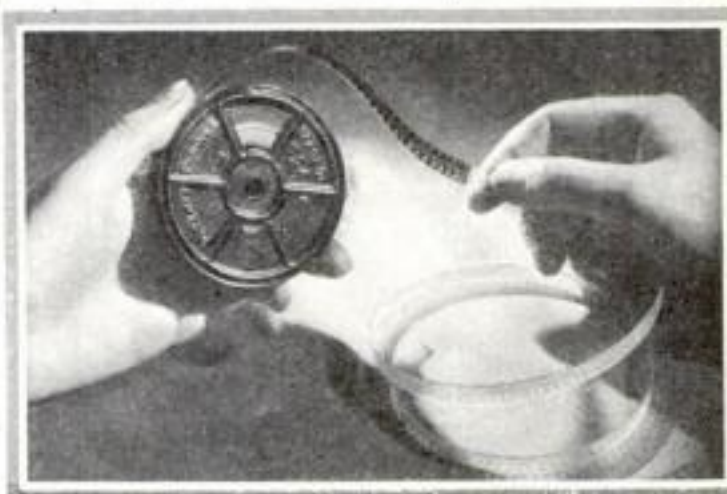
View of interior of camera showing spools, upper and lower right, which are reversed for second exposure



Here is the movie camera whose half-inch lens gives great depth



Fine-grained panchromatic film with jet black backing to prevent fuzziness due to light getting through emulsion. Development removes dye



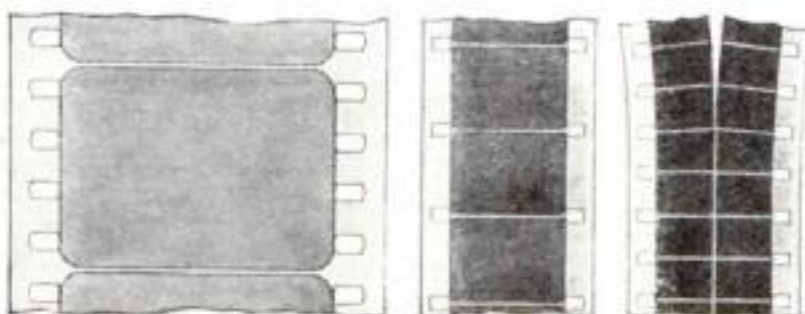
Winding the finished film on reel after it has been split lengthwise and spliced to make 50 feet of film

light, aim the camera at the subject, and press the release lever.

To make the new system of miniature movies possible, an entirely new type of film had to be devised. Clearness of detail in a picture is determined by the relative size of the whole image to that of the tiny grains of silver that compose it. Sixteen-millimeter pictures have been considered the smallest practical with the finest grained film hitherto available. Research engineers of the Eastman Kodak Company recently combined such fineness of grain and high-speed sensitivity to light in a new kind of panchromatic film that they were able

to build around it the movie process using eight-millimeter pictures. The back of the film is dyed jet black, further increasing the sharpness of detail by removing halation and consequent "fuzziness" from light that gets through the emulsion at the time of exposure and is reflected back to it. The black dye absorbs a large proportion of this light.

The object of taking two rows of pictures on sixteen-millimeter film and then splitting and splicing to get fifty feet of eight-millimeter film for projection is to make possible more compact camera construction. Twenty-five feet of sixteen-millimeter film go onto a small diameter spool, and the thin, fifty-foot reels of eight-millimeter film are of convenient size for home storage and for use with a simple projector.



At left, actual size of thirty-five-mm. film. Center, sixteen-mm.-film, and at right, new film partly split into eight-mm.-strips. Notice the double perforations along each segment

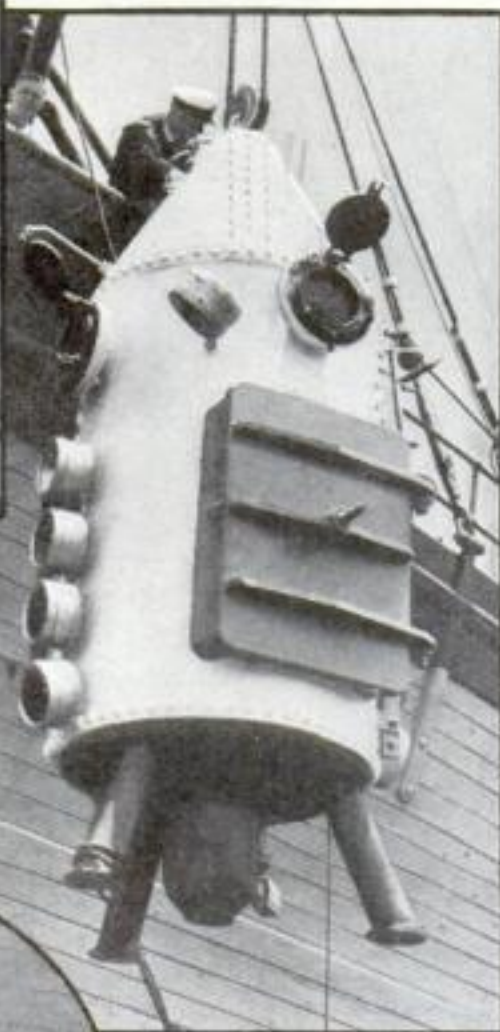
DIVING BELL NOW OPEN TO SIGHT-SEERS



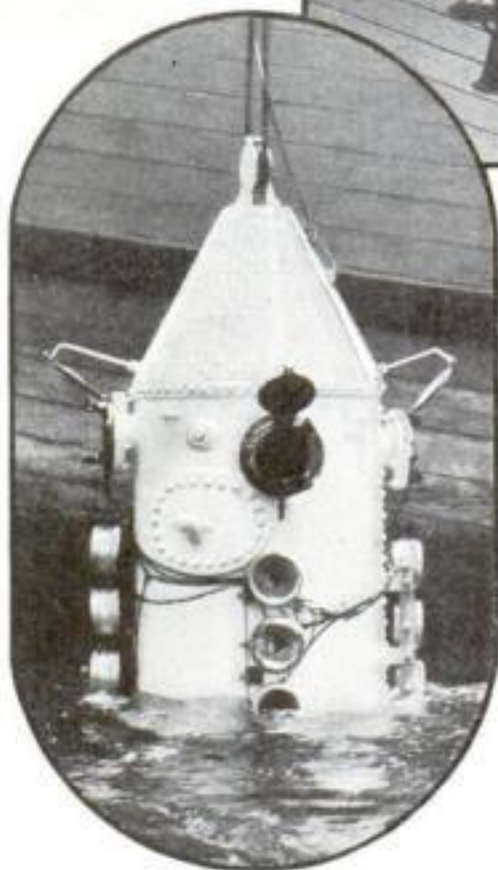
Passengers entering the diving bell all ready to go down 100 feet beneath sea's surface

level. Massive legs enable the bell to rest on the sea bottom.

Sufficient oxygen is contained in the air of the four-foot-diameter shell to last four persons four hours, but as a precaution an electrically-driven air purifier is kept in operation while the bell is under water. In case of emergency 125 cubic feet of pure oxygen can be released from a reserve tank and when this gives out the four aboard can purify their own breath with individual masks. Passengers could live three days in the air-tight cylinder if the shell should get stuck under water. This, however, is a remote possibility, as the oper-



Steam winch lowers diving bell, seen above with water-tight doors shut. Note battery of powerful lights that illumine the deep so monsters of the sea are visible.



Raising the bell after sight-seeing trip

HOW does it feel to plunge 100 feet beneath the waves? Sight-seers may now experience that sensation, with the placing in service of the first diving bell ever open to the public. Operated from a pleasure ship off Long Beach, Calif., it is lowered over the side with an operator and three passengers inside. They watch through the portholes such scenes as Jules Verne might have described, as swordfish and devilfish swirl in surprise about the steel intruder and are revealed by its white and colored spotlights.

The three-ton steel cage, originally designed and operated by William Gordon, English submarine and salvage engineer, for use in surveying the sunken ship *Brother Jonathan* off Crescent City, Calif., was remodeled to accommodate four persons on undersea drops.

Operated by means of a crane, steel cables, and a steam winch, the shell sinks with 1,500 pounds of steel ballast aboard. It takes about a minute to touch bottom at the 100-foot

Alaska, who has worked on the project of attempting to raise the sunken ship *Islander* in Stephens Passage, installed and operates the pleasure device.

ator, who goes below with his three passengers on each dive, can release the ballast ordinarily carried to overcome the buoyancy of the bell, allowing it to shoot to the surface.

Steel flaps can be tripped over window apertures, sealing them water-tight in case the thick glass covering the portholes should break.

William Lindley, salvage expert of Juneau,



LOUDSPEAKERS ANNOUNCE THE OLYMPIC WINNERS

TO ANNOUNCE the winners of events at the Olympic Stadium, Los Angeles, Calif., a loudspeaker system was designed. A circle of huge horns, installed atop a tall mast, is connected through an amplifying system to the announcer's microphone. In this way a single human voice is magnified to a roar that fills the stadium. The photograph shows the horns as they appeared to a person looking up the mast. Engineers declared the installation the largest and finest of its kind in any stadium.

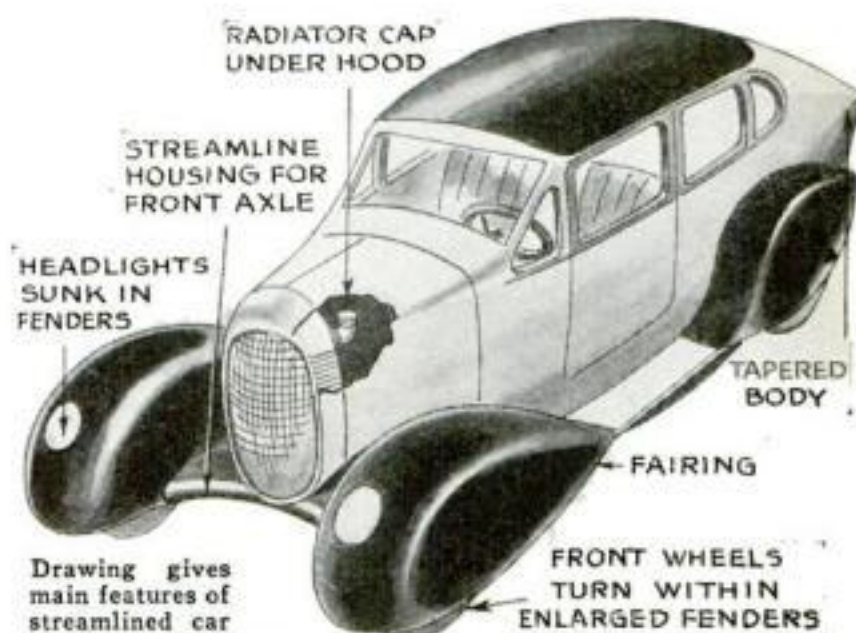
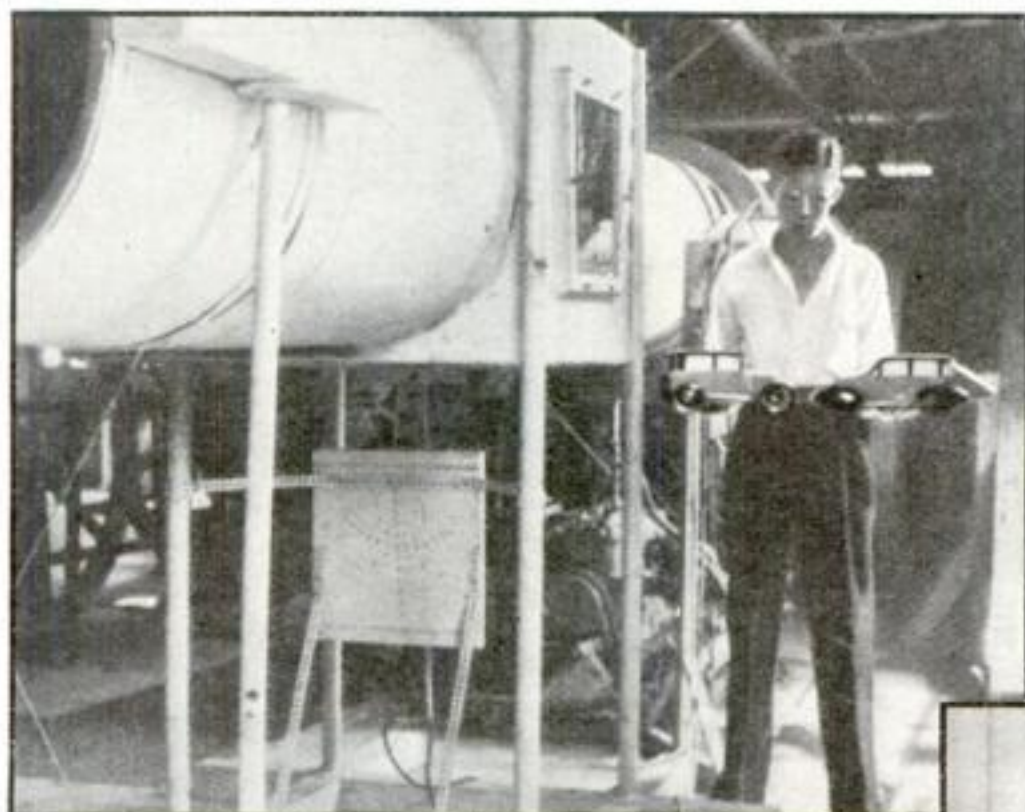


Bench vise that locks itself when jaws are tightened but is released as the screw is turned

SWIVELING VISE LOCKS ITSELF IN POSITION

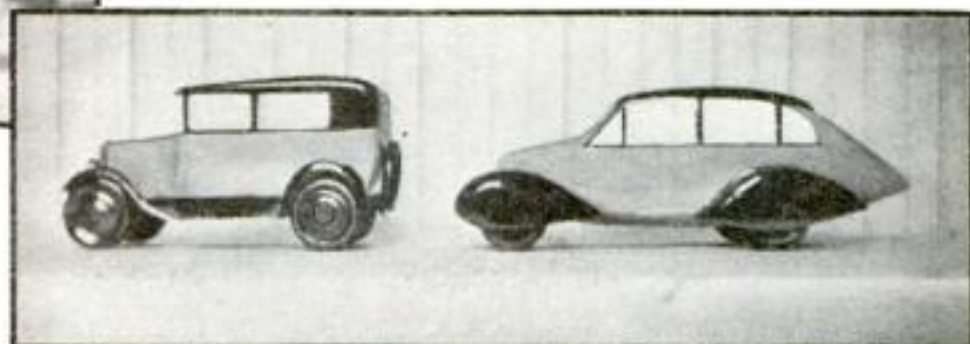
A NEW swiveling bench vise, turning both horizontally and vertically and automatically locking itself in position when the jaws are tightened, has been perfected by a California inventor. The moment that work is clamped in the vise, it becomes absolutely rigid, but to change its position it is necessary only to loosen the screw slightly. It is claimed by the manufacturer that this is the only distinct advance in vise construction that has been made in many years. The inventor has designed styles both for woodworkers and machinists, one three-pound model being sufficiently light for a carpenter to carry about with him in his tool kit.

Wind Tunnel Used to Perfect Streamline Design for Autos



Using an experimental wind tunnel at the University of Oklahoma, two graduate students have worked out what they believe to be a perfect streamline design for cars of the future. Tests of models showed that a sedan of the new type would go half again as far on a gallon of gasoline as one of conventional design, and could attain correspondingly higher speeds, because of reduced wind resistance. The

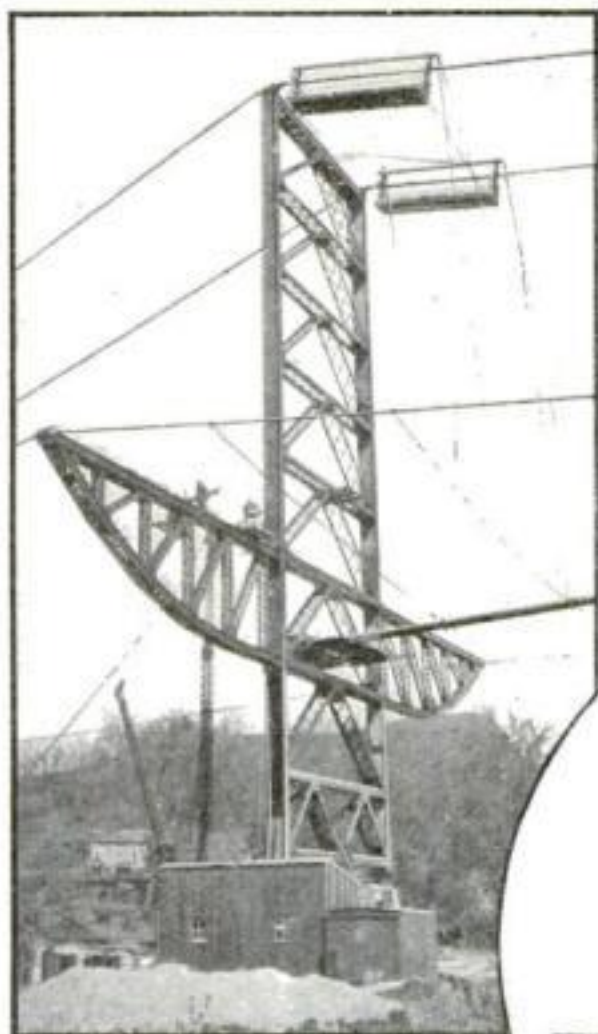
A. D. Oliver, University of Oklahoma, with car model to be tested in wind tunnel. At right, conventional sedan and streamlined car



students, A. D. Oliver and J. S. Thompson, expect their data to aid motor car designers in increasing speed and efficiency. The wind tunnel used was sixteen and a half

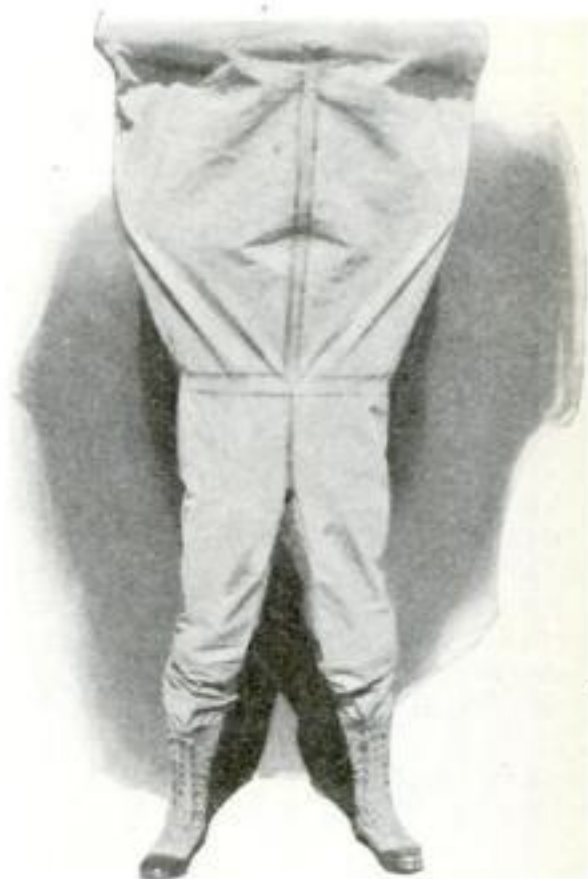
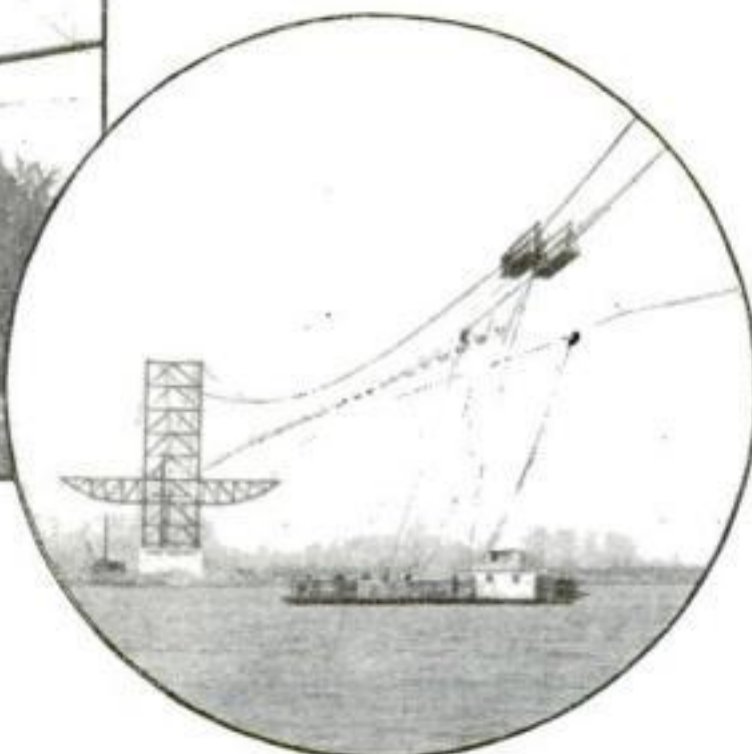
feet in diameter and through it they could drive wind up to 135 miles an hour. The drawing at top illustrates the main features of the streamlined design.

SUSPENSION BRIDGE CARRIES PIPE LINE



This tower, for pipe line suspension bridge, is 130 feet high and weighs 100 tons. At right, workmen, seventy-five feet above the Missouri River, attach cradles to carry the pipe line across the river

NEITHER pedestrians, automobiles, nor trains will cross a bridge just completed over the Missouri River near Ponca, Neb., yet it represents an engineering feat of the first magnitude. Longest of its kind in the world, it was erected to carry a fourteen-inch pipe line for natural gas over the waterway. The structure is a true suspension bridge, and its main span is 1,280 feet long. Photographs reproduced here, taken during its erection, give a striking impression of the giant undertaking. The two main towers are 130 feet high and weigh 100 tons each. They are hinged at the bottom to allow for expansion and contraction of the steelwork.

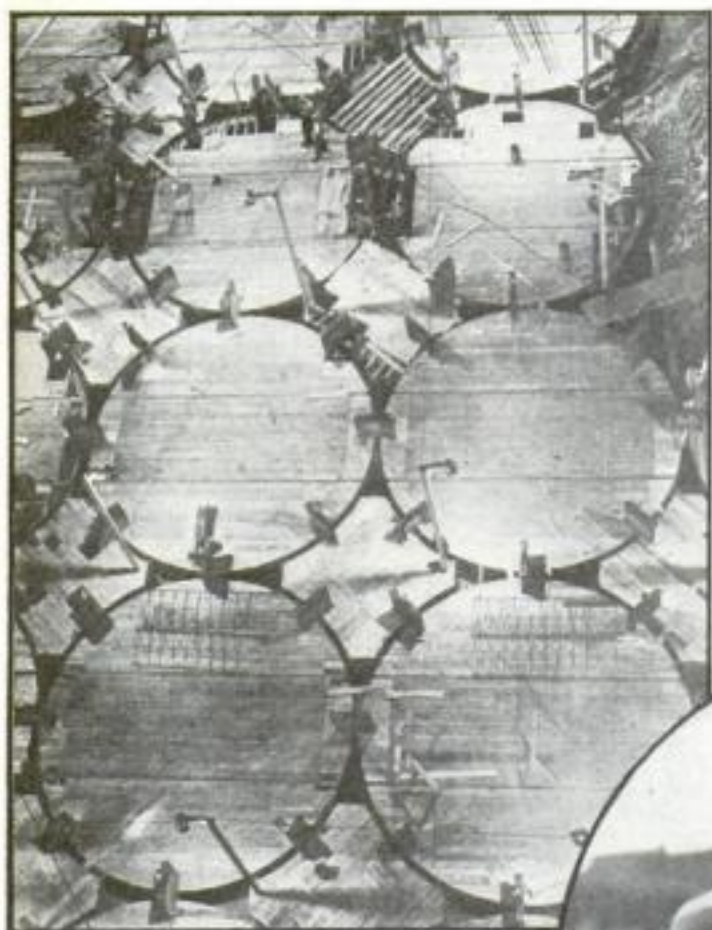


RUBBER APRON KEEPS WADER FROM SINKING

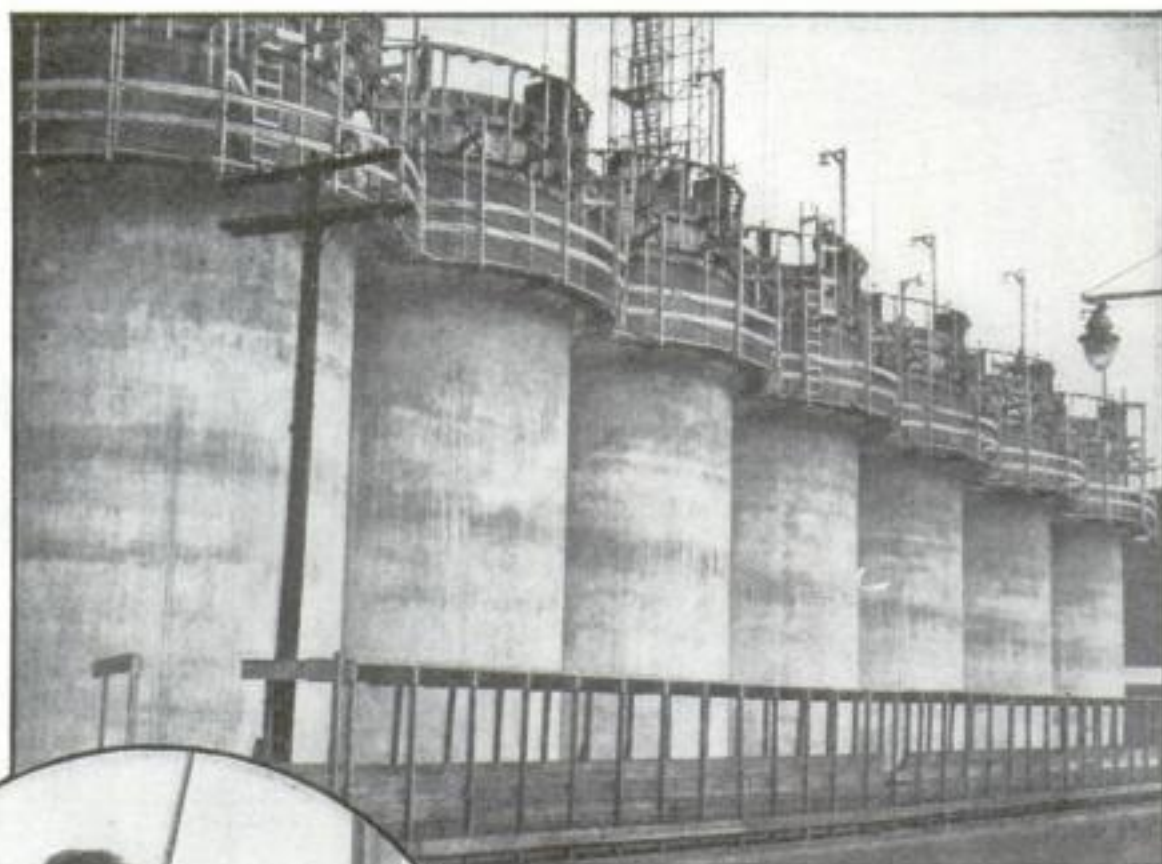
SO WADERS may keep dry and venture safely into deep water, an odd rubberized costume has been introduced. Its floating apron, with a pneumatic rim, encircles the head of the wearer and supports his weight when he steps out of his depth. The "safety wader" was originally designed for a wading duck blind, but has been widely adopted by fishermen who wade in a stream as they fish.

Mushroom Buildings of Concrete Grow Twelve Feet a Day

Below, an air view of a number of forms into which concrete is poured as mushroom buildings grow



BUILDINGS that grow a dozen feet a day until they have reached full height may mark the next period of general construction. The method has been applied successfully to erecting one-piece grain elevators. After ground has been excavated, wooden forms for concrete are built. For grain elevators, the forms consist of concentric rings four feet high, the space between rings being equal to the desired wall thickness. The



This series of grain elevators, having a storage capacity of 1,750,000 bushels, was built by pouring concrete into new movable forms



Operating one of the special screw jacks that are used to raise the forms slowly while concrete sets

forms then are covered over, with the exception of spaces into which concrete is poured, to produce a working platform. Special screw jacks, mounted at intervals around the forms, operate against steel rods which project downward inside the wall spaces. As concrete is poured, the jacks are turned, moving the forms upward at the rate of ten to twelve feet a day. This permits concrete to set sufficiently to hold its shape before the form is moved beyond it. Although the "mushroom" method has been used mostly for circular grain bins, it can be adapted to the building of walls of any other shape.

UNUSUAL PLANE HAS REAR PROPELLER



Above, side view of newly designed plane that has two wings on each side on the same level and is driven with a tail propeller. Below, view shows plane's strange wing arrangement

AT LAWRENCE, KANS., a plane with two wings on each side on the same level has just been designed. The pilot occupies a seat in the nose of the fuselage. Back of him, in the center of the ship, is the motor which is coupled to a rear propeller, with a drive shaft and two universal joints. There are no elevators, the ailerons on the trailing edge of the front wings serving as elevators. The rudder is above the propeller.

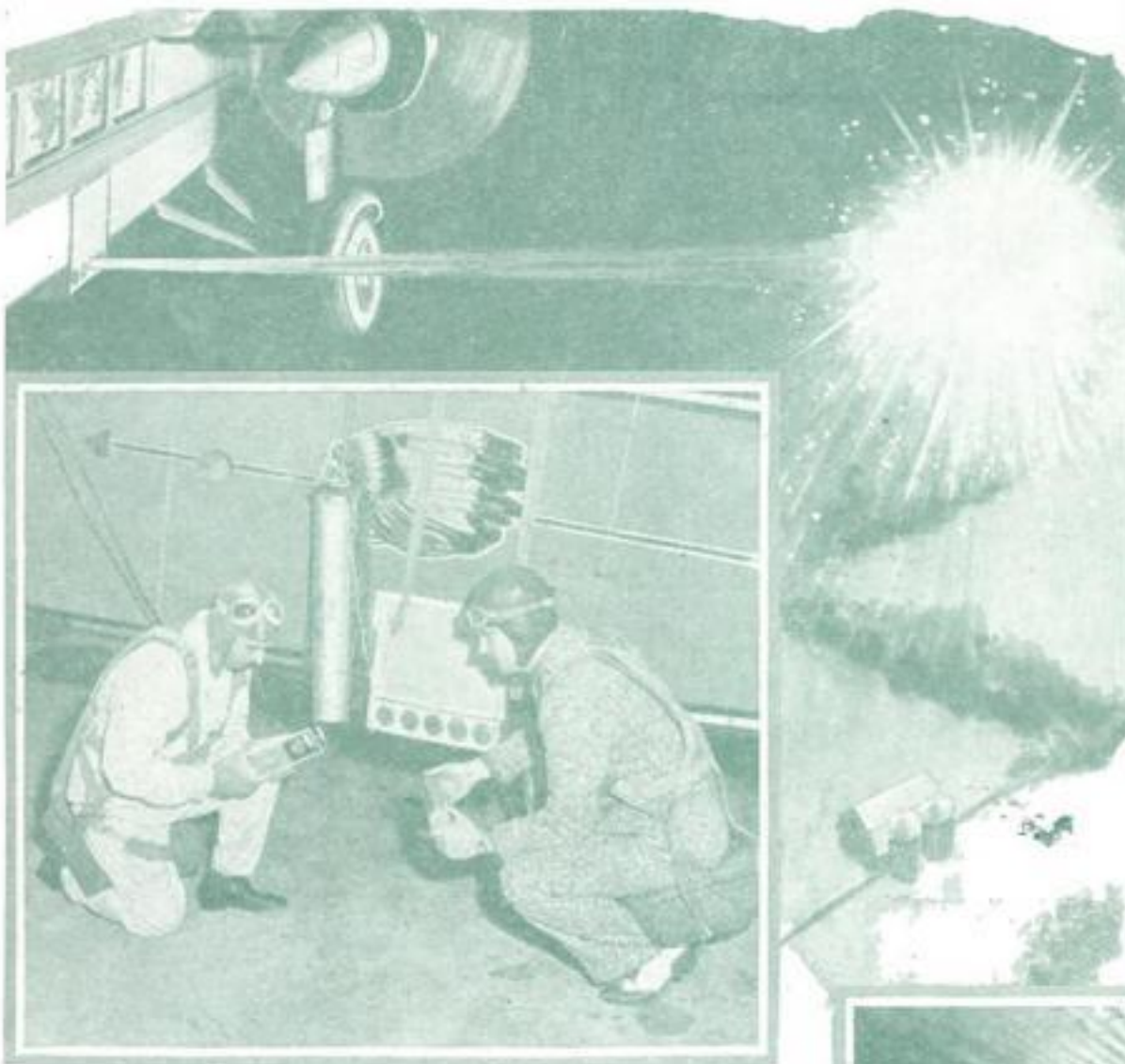


TINTED FINGER NAILS FOR EVENING WEAR

DETACHABLE party finger nails have been patented by a Los Angeles, Calif., inventor as an addition to the wardrobe of the society woman. The thin, tinted shells fit snugly on top of the natural nails, held in place by adhesive cement. As the cement is readily soluble, the nails can be removed at will. They are made in different color combinations to match the gown, rouge, or lipstick of the wearer. They also hide broken or disfigured nails.



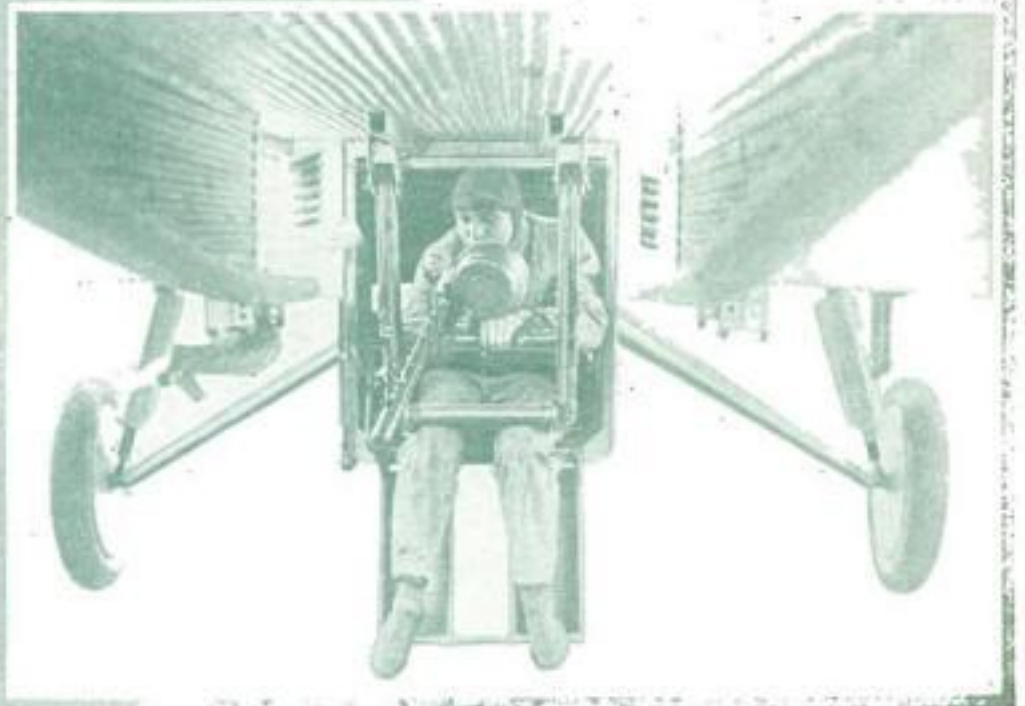
New and Unusual Features of Activity in the Air



Insert shows new flares mounted on the side of plane from which position they are hurled out horizontally to aid a pilot in landing. The flares can be seen behind a big parachute flare of ordinary design. Pilot at left is holding a model of the electric control board attached to dashboard. Pressing a button on this board releases a flare which bursts into flame as suggested in the drawing, illuminating the ground brightly



The nose of this British airplane looks like a grotesque human face, and the illusion was greatly heightened when the owner added a few deft touches with a paintbrush. The propeller completes the caricature by suggesting a moustache



Enemy flyers attacking the plane shown above would find themselves within range of the gunner seated in a new style crow's nest beneath the fuselage. Facing the rear, he is prepared to ward off attacks from that direction and from below. Leg guards protect him from wind pressure

Below is a view of the dirigiplane, a recently demonstrated craft invented by Dr. C. L. Snyder of South Bend, Ind. Half airplane and half dirigible, it lacks wings and tail. Its body will be self-supporting when fitted with helium tanks and propellers. It has been successfully towed as a glider



A vertical wind tunnel in which model airships are tested has just been put into use by the Guggenheim Airship Institute at Akron, Ohio. Hans Brueken, assistant director, is studying effect of the air blast on a small model dirigible



Waste Water in Oil Fields Yields Rich By-Products



Above, tall tanks in which oil is dehydrated and separated from sand. In circle, taking a sample of the recovered oil to test its purity, and at right, skimming oil from waste water

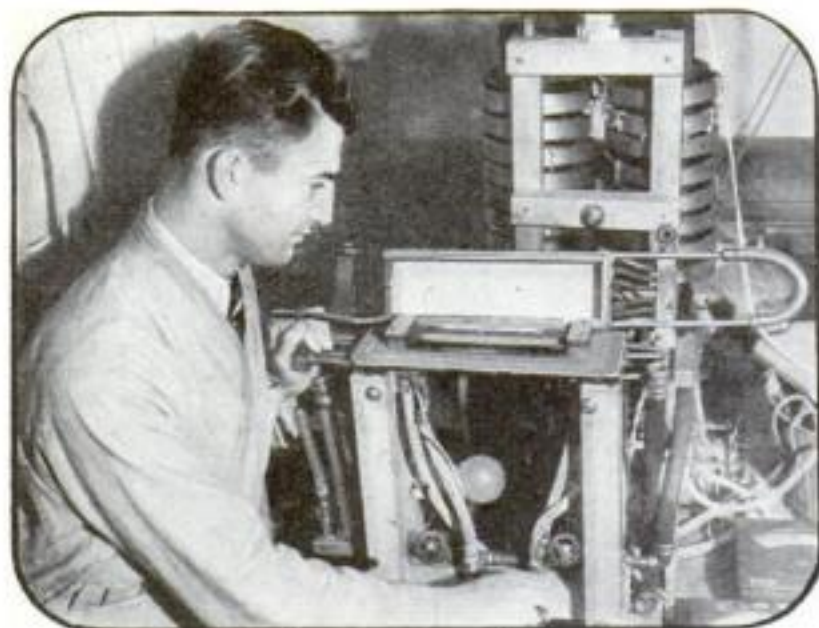
How a troublesome waste product was unexpectedly made to yield riches in by-products is one of the newest romances of the California oil fields. Water that comes with the oil from wells was considered a nuisance until state regulations recently prohibited oil companies from turning the waste water loose. Fourteen companies then joined in building a cooperative disposal plant where ways were found to extract the objectionable oil and sell it.

First the water passes into vats where the oil is skimmed off. Chemically or electrically treated in dehydrators, this oil is

brought to regular standards of purity. From 200 to 600 barrels of oil are salvaged daily.

Meanwhile the skimmed water passes to a chemical plant, where its mineral content is precipitated and chemically treated to yield pure iodine. Water from oil wells is 250 times richer in iodine than sea water, containing the element in the proportion of about one pound in two thousand. When the waste water is finally stripped of its valuable contents, it is clean enough to be turned loose without risk of polluting the beaches.

MELTED GRANITE FORMS TINY VOLCANOS



Above, apparatus used to produce man-made volcanos in granite and, right, tiny craters

and forms realistic craters. Microchemical analysis shows striking similarity between these tiny, fiery peaks and real volcanos. Certain minerals were produced synthetically for the first time in this experiment. The tests were undertaken by Dr. Robley D. Evans to determine the amount of radium in rocks, and the granite was boiled in order to drive out and measure the gaseous emanation of radium that it contains. The photograph below shows the miniature craters produced in the experiments.



MINIATURE volcanos were made to order, the other day, at the California Institute of Technology. Granite, melted and boiled at a temperature of about 3,600 degrees F. in a laboratory furnace, furnished the volcanos. Feldspar, one of the constituents of granite, melts first, and as the temperature rises, the whole mass fuses



LIGHTS ON BACK FLASH UMPIRE'S DECISION

FLASHING lights announce the decision of a baseball umpire in a signaling system invented by a Tampa, Fla., clergyman. The umpire operates a switch box on his chest, while lamps on his back make the ruling known according to a code.

Ocean Airports of Artificial Ice

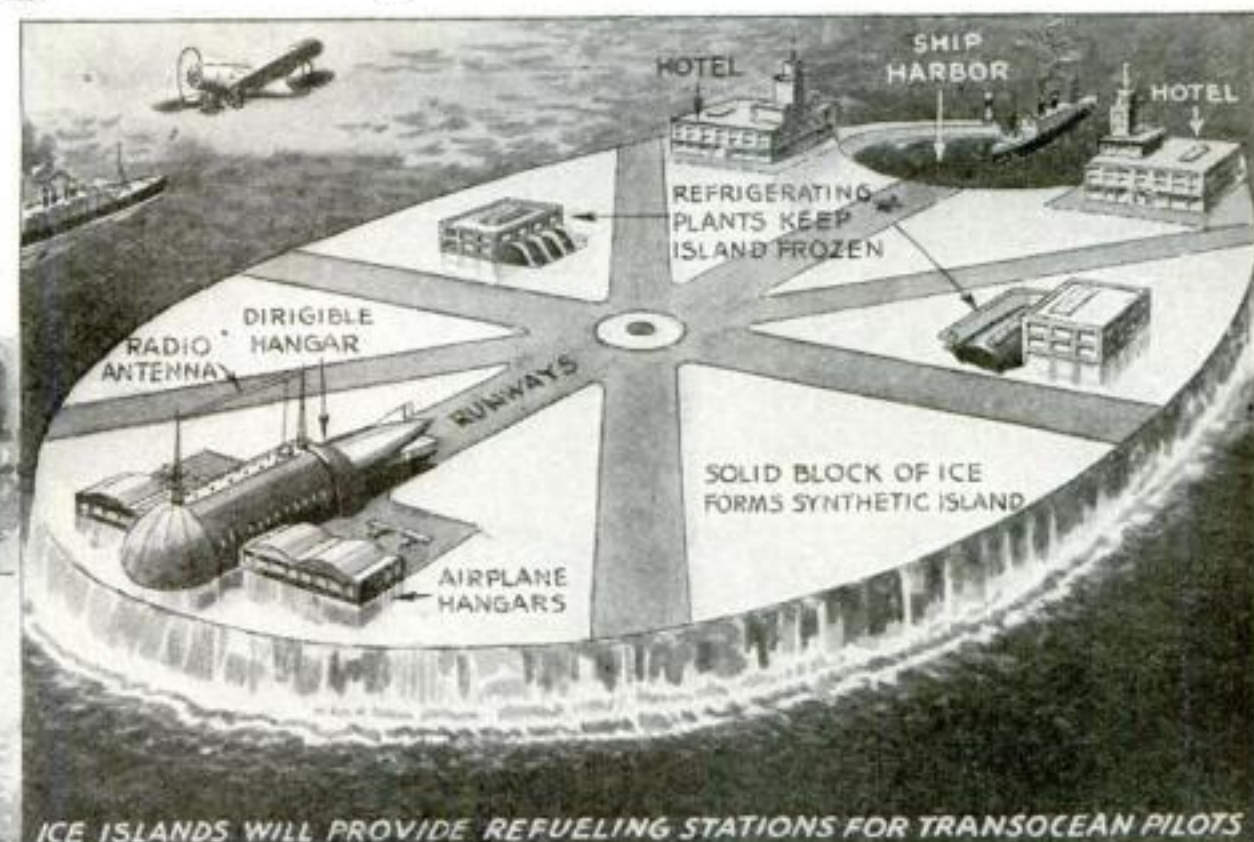
*Daring Project Would
Dot Sea with Islands
Kept Solidly Frozen*



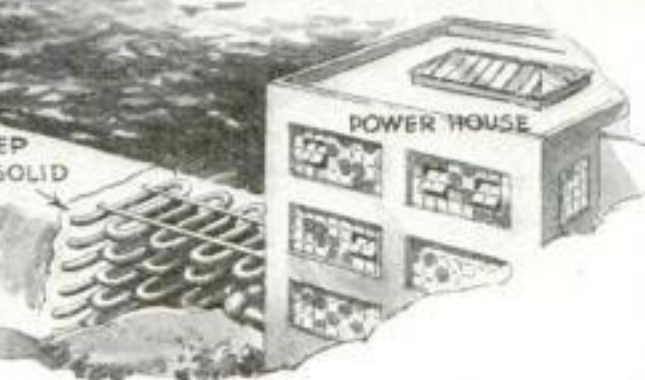
By artificial refrigeration, a German inventor would produce breakwaters at danger points near shore as shown in drawing above. Pipes with freezing mixture are seen in cutaway portion.

ISLANDS of ice for ocean flyers, resting on the sea bottom and kept firm by refrigerating plants, are visioned by a German engineer. Such man-made ice cakes, he declares, could be produced for transocean airlines at a fraction of the cost and time involved in other proposals for "sea-dromes" or midway stations.

Engineers have hitherto overlooked ice as a building material, according to Dr. A. Gerke, of Waldenburg, Germany, originator of the startling plan. The great ice caps of the polar regions prove that ice may be as solid and lasting as rock. Modern advances in refrigerating science, Dr. Gerke maintains, now forecast permanent structures built of ice in temperate regions.



Island of artificial ice proposed as mid-ocean landing field for aircraft, with a harbor to shelter the supply ships that serve its needs.

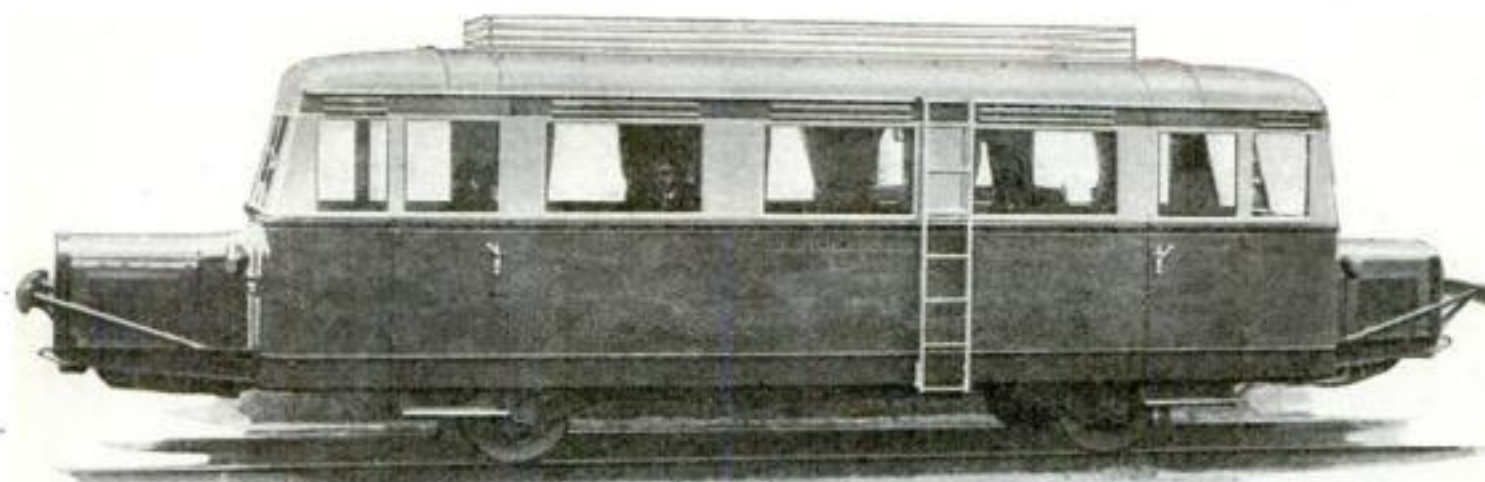


To create an island airport, Dr. Gerke would anchor two or three ships equipped with refrigerating plants at a suitable shallow spot. Divers would lay a network of vertical and horizontal pipes to the sea bottom. As a freezing mixture is pumped through the pipes, a solid island of ice would take shape. A permanent refrigerating plant on the island would thenceforth keep it frozen—easy once the ice cake is formed, according to Dr. Gerke. Artificial islands for deeper spots could be formed near shore, towed to sea, and anchored, he believes. He also points out that two years ago a sunken ship was raised in the Lake of Zurich, Switzerland, by forming a block of ice within the hull to plug a large leak.



How a salvager plugged hole in a derelict with artificial ice and raised the vessel.

First Two-Way Rail Bus Now Running in Germany



A GERMAN railroad has recently put into operation what is believed to be the first two-way rail bus in the world. At each end of the body, which is of conventional bus construction with flanged wheels, is a driver's compartment and a complete power plant. Thus the bus may be driven in either direction without reversing it on a turntable. The odd vehicle is designed to carry thirty-four passengers. Baggage goes on the roof.

World's Strictest School

Physical Perfection



Future Army flyers arriving at Randolph Field, Texas, where a stiff training course produces high class aviators

By CLAYTON R. SLAWTER

FLY northeast fifteen miles over the flat Texas table-land surrounding San Antonio and you pass above the only "air city" in the world, a community housing 3,500 inhabitants and laid out with the one aim of meeting the needs of flying men. It is Randolph Field, the Army's new \$10,000,000 college of the air.

Requiring two years to build, it formed the biggest construction job tackled by the Army since the completion of the Panama Canal. At the center of more than 2,000 acres of landing area, covered with Bermuda grass and flat as a pavement, a great hexagon holds the buildings of the flyers' city. There are no towers or other high obstructions. The hangars are arranged in rows around the outer edge like the ramparts of a walled city. They face the level flying fields and the planes take off in all directions away from the buildings.

On this strange city, a few weeks ago, 240 young men were converging from all points of the compass. They were traveling not in airplanes, but on Pullmans, in autos, on motorcycles. Some were hitchhiking and one was even "riding the rods" of a southbound freight. From nearly 1,000 applicants, they had been picked for training as pilots and they were on their way to the work and adventures of Randolph Field.

When this training ground for air fighters is operating at top efficiency, it will turn out 1,000 war birds a year. At present, classes of approximately 250 men are admitted in February, June, and October. The first student hopped off on his initial flight last fall.

To be eligible for training at Randolph Field, you must be between twenty and twenty-seven years old, unmarried, and

have two years of college education or its equivalent. Application is made in writing to the Chief of Air Corps, War Department, Washington, D. C.

At the nearest Army air base, besides a regular test of heart and lungs, candidates face a battery of intricate scientific instruments, manipulated by a flight surgeon in a physical examination so stiff that sometimes ninety percent of the applicants are rejected. There are spinning chairs, "re-breathers," "wobbleometers," and strange vision-testing apparatus unlike anything else on earth. Frequently, they reveal defects of muscular coordination or vision hitherto unsuspected.

Not long ago, for instance, a

Cadets receive careful training on every part of an airplane, and below they are balancing and aligning the big propellers



HOW MUCH DO YOU SWAY?

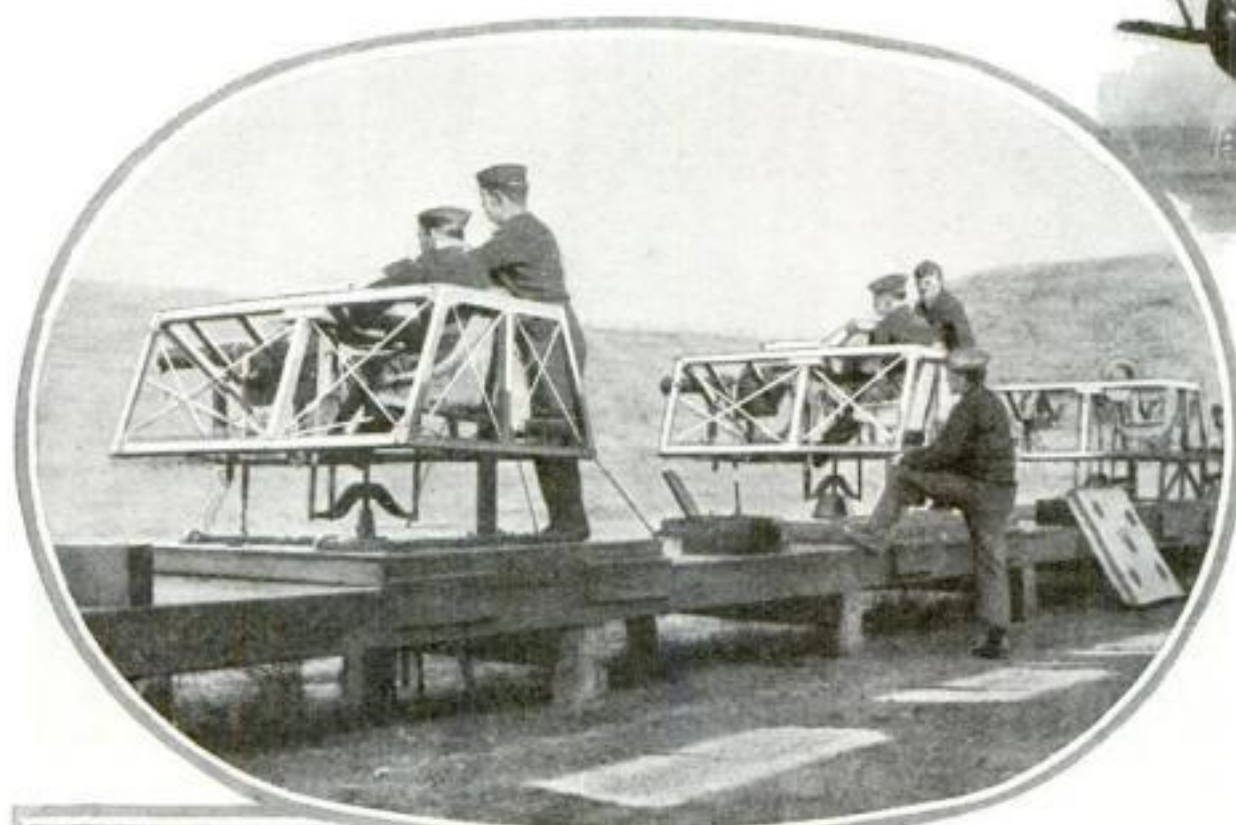
With closed eyes and outstretched arms, the cadet stands on the wobbleometer, a small platform that records his swaying movements, while he endeavors to maintain his balance. This is a Randolph Field test for stability of the body

Trains Our War Birds

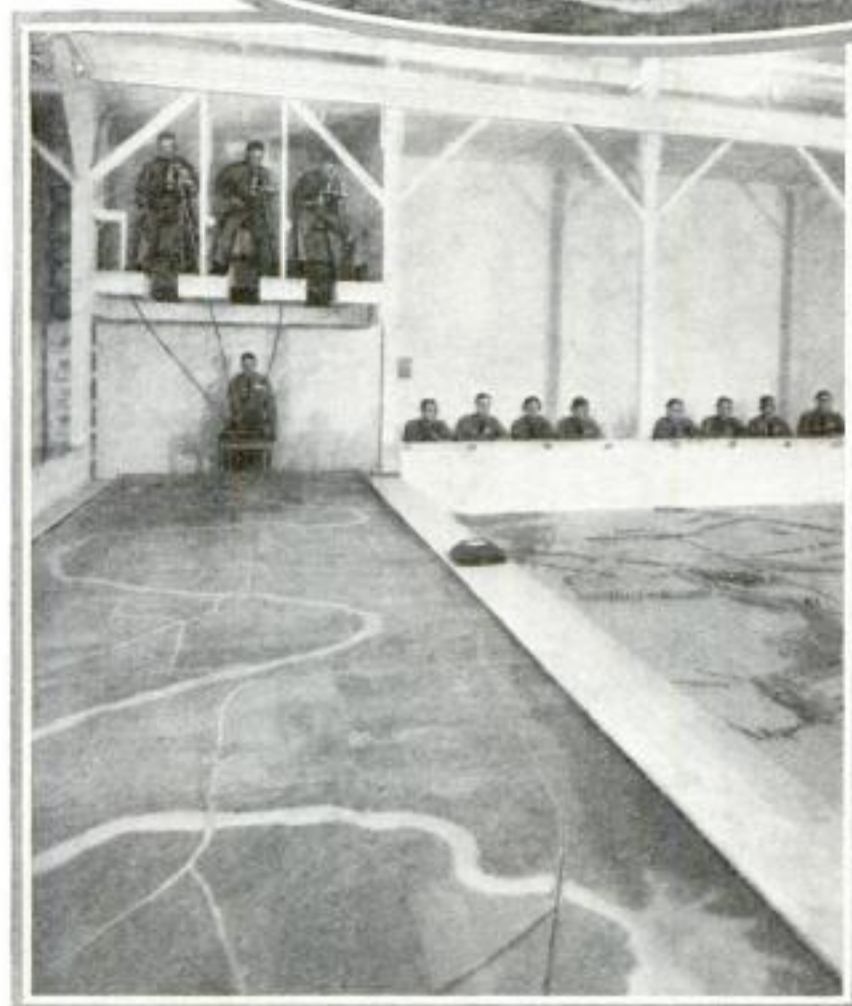
Demanding of Randolph Field Cadets



With cockpit covered and only instruments to guide him, a cadet goes aloft to accustom him to blind flying—one of the most difficult stunts in the school's course



Careful training is necessary in the effective use of machine guns, and on this range cadets get constant practice with the weapon



In learning to use bomb sights, left, cadets are required to aim at spots on floor map, which moves beneath the platform they stand on. Those at right are spotting troops on stationary map

crack end on the West Point football team got no farther with the tests than the apparatus which shows the width of the field of vision. Looking like an elaborate astronomical instrument, this device reveals how far a person can see to either side while he is directing his gaze straight ahead. In landing and formation flying, a wide field of vision is essential. The test showed the West Pointer had an unusually narrow range of vision and this explained a mystery in connection with his football playing. He had been a whirlwind at blocking, tackling,

and getting down the field under punts. But time and again he had missed forward passes coming from the side and back. His unsuspected narrow field of vision had prevented him from seeing the approaching ball until it was too late.

Another curious piece of apparatus, called the "wobbleometer," tests body stability. The candidate, standing upon a small mechanical platform that tilts from side to side, closes his eyes and with arms outstretched tries to keep his balance.

The spinning chair whirled you like a top, ten times to the right in exactly twenty seconds and then ten times to

the left in the same space of time. Before and after the test, your blood pressure is taken and at the completion of the whirled your eyes are timed for rapid rotation or shifting of the eyeballs, which indicates dizziness.

To discover if you can stand the rarefied air of high altitudes, you take your place in the queer apparatus called a "rebreather." Here you use your own exhaled breath over and over again, chemicals purifying the secondhand air and removing the carbon dioxide. At the same time, you perform a

number of tasks under the observation of experts who note the effects of the diminishing oxygen supply.

Then you pass on to half a dozen devices that discover all there is to know about the most important part of your body in piloting high speed planes—your eyes. One indicates your ability to judge distances, another the angle of convergence of your eyes, another your color sense, another the keenness of your sight at dusk, and still another the speed with which you can alter the focus of your eyes from far to near objects and back again.

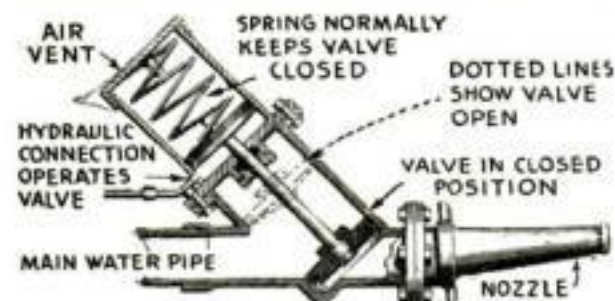
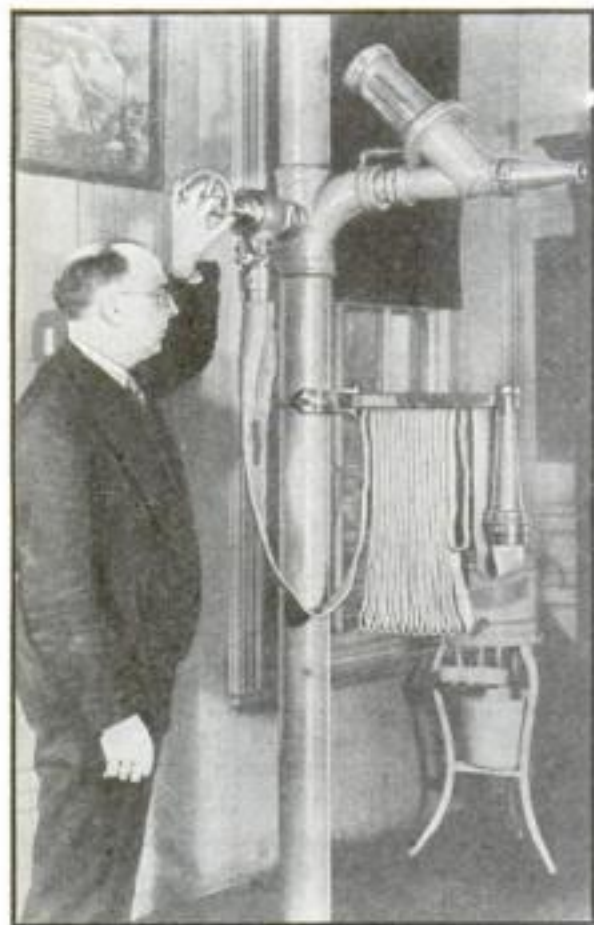
Facing banks of small electric lights, you manipulate levers to keep different combinations of bulbs burning while automatic recording devices check your coordination between eye and muscle. In addition, there are personality examinations to uncover temperamental weaknesses which might cause a flyer to "crack" under the nervous strain of combat piloting.

It is no disgrace to fail these examinations, for they are probably the strictest in the world. Men who passed the physical tests at West Point and Annapolis with flying colors have been turned down on the evidence of these scientific testing aids now employed in Air Corps work. Only the fittest survive. As a result, fatal crashes due to the physical failure of pilots have been almost eliminated during the training period. Ninety percent of the fatal training crashes, in one year before the strict examinations were begun, were attributed to this cause.

THE ten to twenty-five percent of the candidates who get past the examinations are placed on the list and wait their call to Randolph Field. In this selection, members of the Regular Army are given preference. Then National Guardsmen are chosen, then members of the Officers Reserve Corps, then applicants who have had four years of college education, and, last of all, those with only two years of college training or its equivalent. A college education, experience has shown, is an asset to a man who sets out to "win his wings."

Cadets at Randolph receive seventy-five dollars a month and one dollar a day for food, and if "washed out" during the course, they receive an honorable discharge and their fare home. However, they come to the field at their own expense and consequently make the journey in a wide variety of ways. *(Continued on page 95)*

New Remote Control System Fights Skyscraper Fires

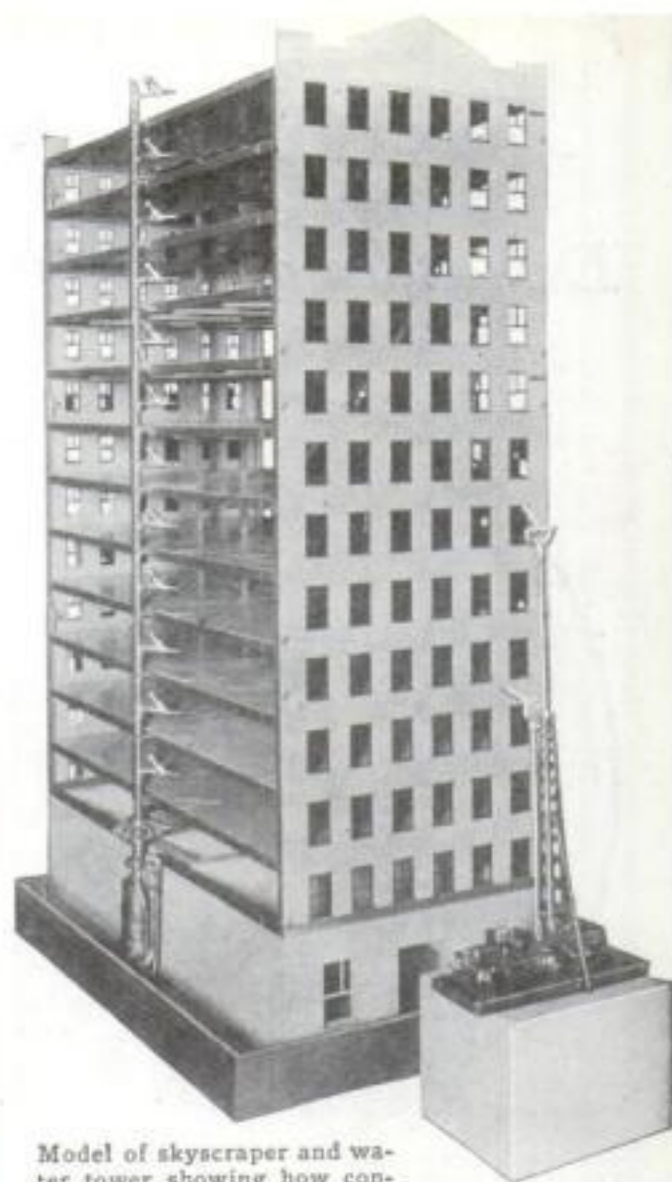


Full sized installation of remote control fire fighting system with ordinary hose and automatic nozzle; diagram of how nozzle works

FIRST installations have just been made in and about New York City of a "remote control" system of fighting skyscraper fires. By this new method, one man in a fireproof booth can combat flames sweeping an entire building. Fire officials are watching the pioneer installations in a paper factory, oil plant, and other buildings with interest, for they may be the long-sought means of controlling fires in tall buildings.

As cities grow skyward, fire chiefs have become worried. Their tallest water towers are virtually ineffective above a building's sixth floor. To fight a higher blaze, firemen must risk their lives groping with hose lines up smoke-filled stairways. The law requires standpipes with fire-hose connections on every floor, in buildings of certain dimensions, but they are useless when the fire has gained such headway before discovery that they cannot be reached through a barricade of flame. In factory or loft buildings, where three fourths of the worst fires occur, this is often the case. It is to save lives and property in high industrial buildings that William F. Conran, New York hydraulic engineer, has designed the new fire-fighting system.

A movable standpipe that runs the entire height of the building is the essence of the "remote control" system. Besides conventional hose connections upon the



Model of skyscraper and water tower showing how control system surpasses ordinary apparatus. At left, drawing suggests how the remote control system would be used in fighting of a fire in a modern skyscraper

standpipe, at every floor are automatic nozzles controlled from a distance. The entire standpipe can be raised, lowered, and twisted to aim water directly toward the base of the flames.

The operator stands in a fireproof booth on the first floor or in the basement of the building, to which access may be had from the street, with all the controls within his reach. He need not be a fireman, although firemen would logically man the apparatus as soon as they arrived. Any person may operate a simple hand lever that turns the whole standpipe and all the nozzles upon it. Another simple control actuates a hydraulic lift that raises or lowers the standpipe and its nozzles. Individual cocks or valves in the control booth turn on or shut off the nozzles on separate floors.

At no time need the operator endanger himself. The moment that a fire becomes out of control from the old-type hose on each floor, he retires to his protected booth and becomes a one-man fire department under the direction of observers at safe vantage points. Should the building appear in danger of collapse, the operator need remain in the booth only long enough to turn on the cocks opening the nozzles. Lashing a rope around the turning bar, he retreats across the street and revolves the nozzles by pulling on the guide rope.

There is no limit to the height at which the remote-control standpipe is effective. For the tallest buildings, fire engines may couple their pumps to the system to shoot water as high as it is required. Approval of the new system by the National Board of Fire Underwriters, and reductions in insurance rates wherever it is installed, testify to its effectiveness.

Fascinating Experiments

ANY AMATEUR CAN PERFORM

with Simple Apparatus



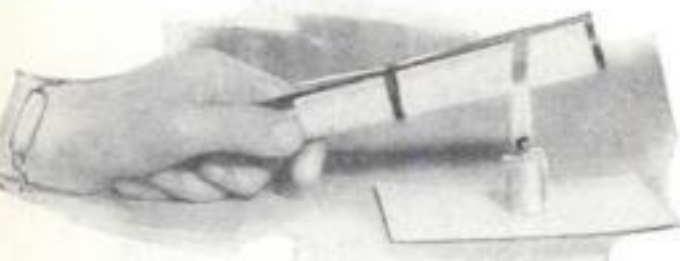
A DANCING LIGHT. Hold an ordinary horseshoe magnet close to an electric light that has coiled filaments. If the light is connected to an alternating current circuit, the filament will begin to dance and remain in motion as long as the magnet is near. The polarity of the filament coil changes with stated frequency so that at one moment it attracts and at the next repels, thus giving the effect of rapid dancing motion.



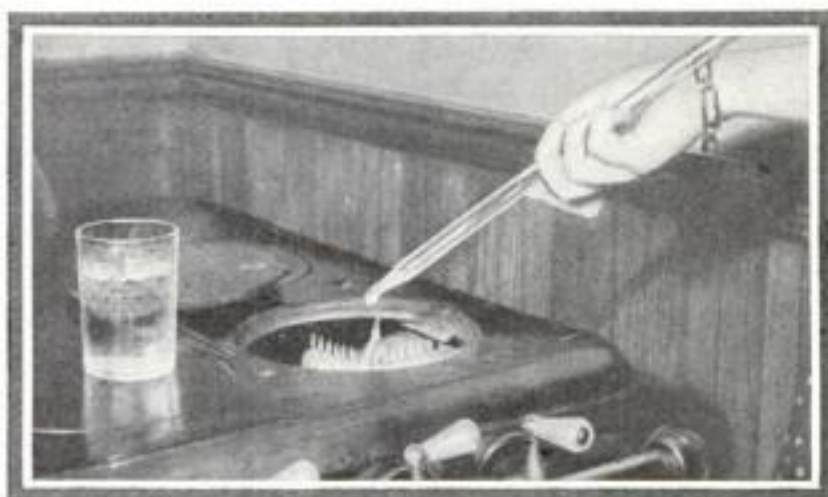
IT'S AIR PRESSURE
Put a bit of candle on a saucer and light it. Then partially fill the saucer with water and invert a glass over the candle as above. Candle will go out and at that instant the water in the saucer will rush up into the glass. The burning candle has, consuming the oxygen, created a vacuum. Air pressure does the rest.



WHY WHITE CLOTHES ARE COOL. Place a thin shaving of wax under a piece of black paper and another under a white piece. Then hold an electric heater as shown above. It will be seen that the wax beneath the black paper melts first, as the white reflects the heat.

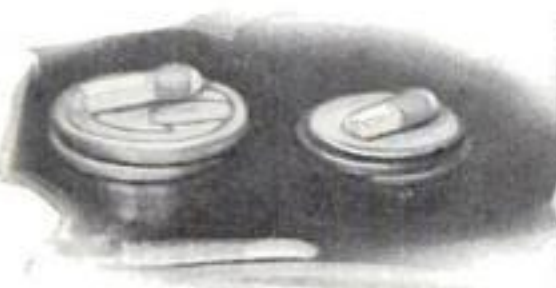


WHEN PAPER WON'T BURN. Wrap a piece of writing paper around brass or copper tubing and hold it in contact with a candle flame. The paper will not burn. It is bewildering until you remember that the metal tube conducts the heat away so fast the paper cannot get hot enough to catch fire.



EXPLODING GLASS DROPS. Get at the corner drug-store a few inches of quarter-inch glass tubing. Light and turn high the gas in the range and hold the glass tube in the flame. Just as the glass gets hot enough to drop, move it quickly so the drops will fall into a glass of cold water. Each drop will explode when its pointed end is pinched.

REFLECTED SOUND WAVE. Have someone hold a watch in the center of a bowl type electric heater. By moving your ears into different positions you will find a point at which the tick will be startlingly magnified. Of course, first remove the heating unit in the bowl's center.

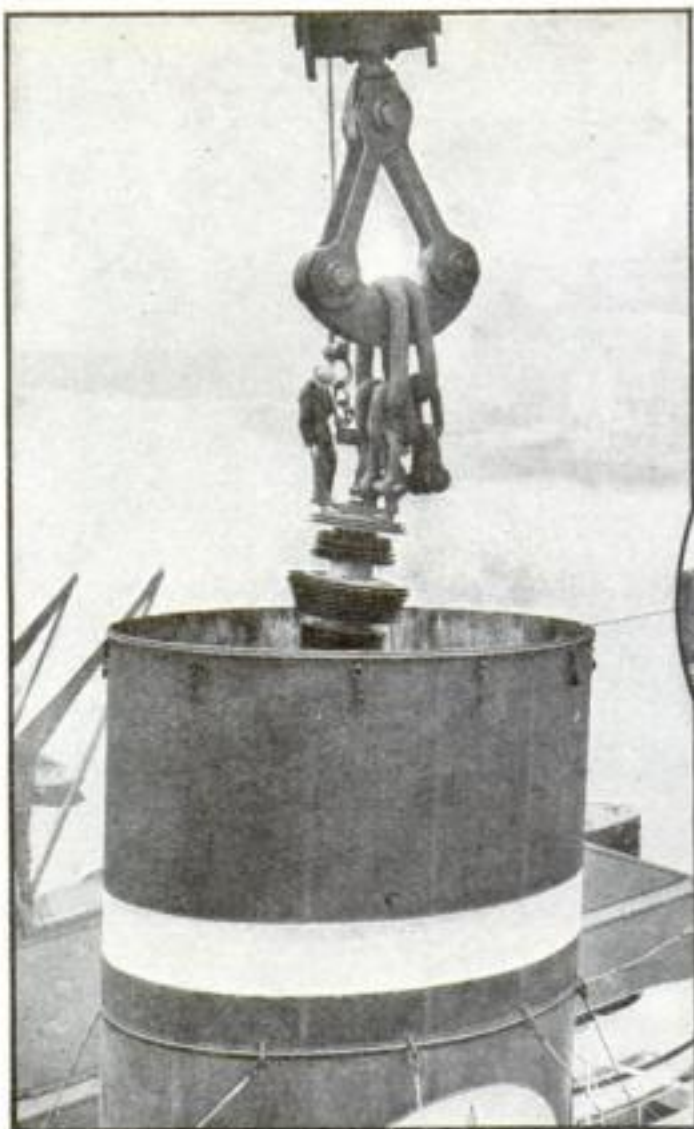


RACE BETWEEN MATCHES. Three quarters and three pennies, in piles, are placed on the griddle of the gas stove. On top of each pile lay the tip of a match. Turn on the gas. It will be found that the match on top of the pennies always lights first. This is because copper conducts heat much faster than silver alloy does and not because the pennies are slightly thinner.

SHOULD you imagine that an especially equipped laboratory is needed to perform interesting and instructive experiments in science, try the ones suggested on this page. Here are eight simple, fascinating tests that any home experimenter can perform with no more apparatus than is to be found in the average household. Though the result will sometimes be surprising, each stunt demonstrates the infallible operation of a certain physical or chemical law and helps to make clear the manner in which it operates to produce this result.



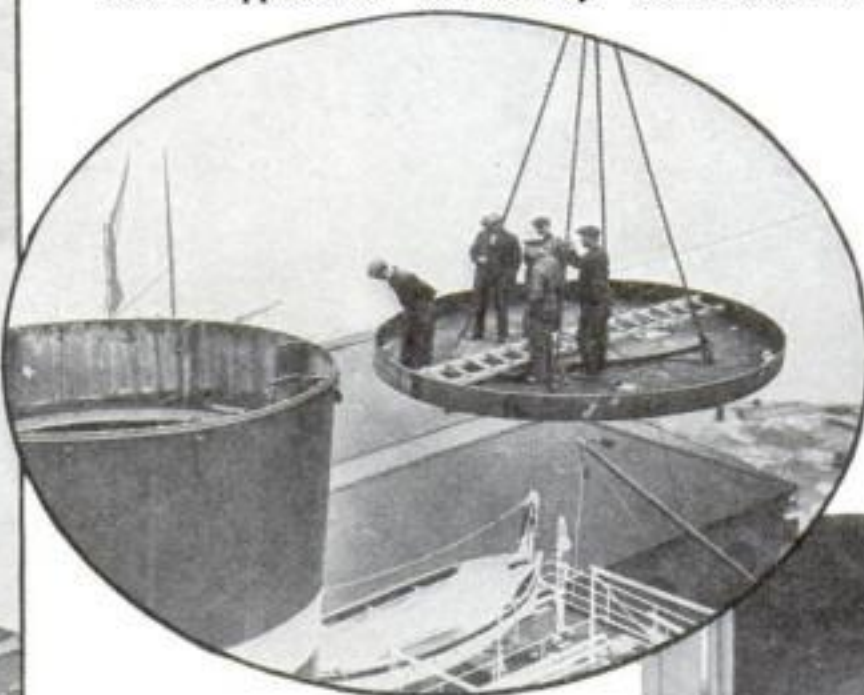
TERRIFIC WEIGHT OF AIR. Set a small piece of lighted candle in the bottom of a glass. Spread thick glue around the edge of the glass and then quickly place a piece of wet paper over the top of the glass. The candle will continue to burn for a moment and then go out. At that moment the paper will be forced into the glass by air weight, as the candle consumed the oxygen in the glass and left a vacuum.



BIG ROTOR GOES DOWN SHIP'S FUNNEL

MODERN liners, especially oil burners, may carry more funnels than they actually need for the sake of appearance. Not entirely

useless are the "dummy" stacks, for the lower part frequently is used for ventilation. Recently another ingenious use was demonstrated when an eight-ton turbine rotor had to be placed in the hold of the S. S. *Avila Star* in England. Brought to the dock on a motor truck, the massive rotor was picked up by a floating crane and lowered down the after funnel to the engine room. Thus the task of easing the burden down the ship's hatches was averted.



At left, turbine rotor, with man standing on it, is being lowered into ship's engine room through the after funnel. Above, returning the rain-catching bonnet to the funnel after the job had been completed

MODEL ROCKET PLANE FLIES FIVE MILES

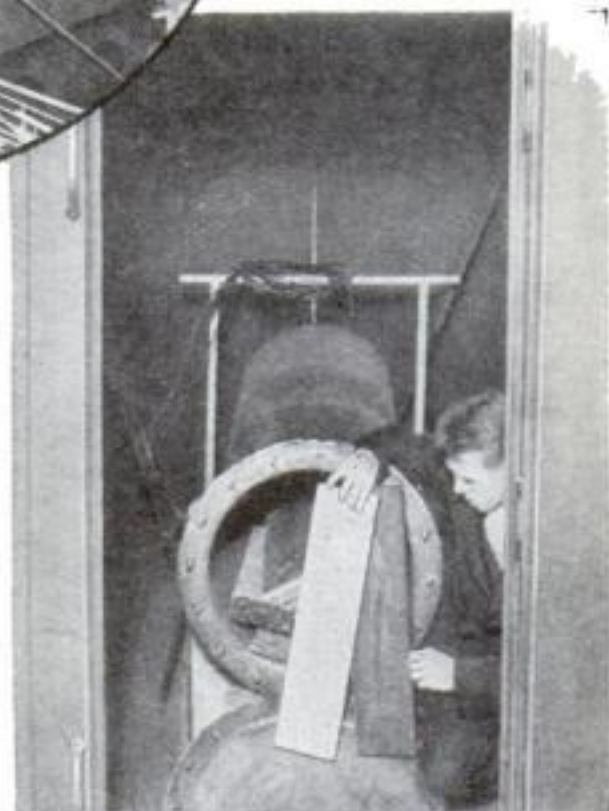
DRIVEN by miniature rockets, a model airplane recently made a five-mile flight over an island in the North Sea off the German coast. The craft, constructed by Reinhold Tiling, German experimenter, is reported to be of an entirely new design.



At right, reading a book while fingers rest on electric push button that registers muscle tension due to bad light. Above, Dr. Luckiesh with apparatus that gages nervous exhaustion

AMMONIA GAS STAINS WOODWORK BROWN

BY TREATING lumber with ammonia gas, the mellowed brown shades of old woodwork have been produced at the U. S. Forest Products Laboratories, Madison, Wis. Ways have been found to apply the process on a commercial scale, dispensing with expensive liquid stains, to nearly all kinds of wood. Dozens of varieties were treated in a small tank to determine the time of exposure and the necessity for application of the gas under pressure.

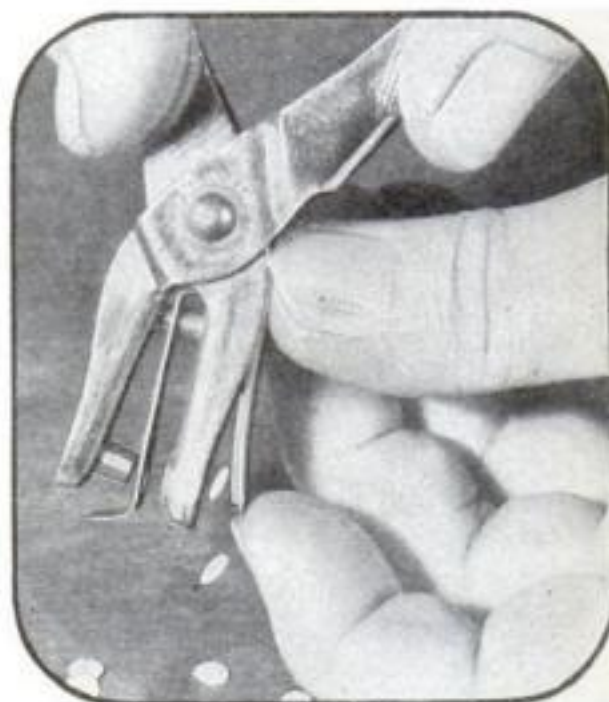


Light piece of pine shows how the dark piece looked before being stained by ammonia gas

BAD LIGHT MAKES YOU TIGHTEN YOUR MUSCLES

IF YOU grip the steering wheel of your car more tightly when you drive at night down a dimly-lit street than you do in the daytime, blame poor illumination. Even though you imagine you can see adequately, you are undergoing a nervous strain that drains your energy, declares

Dr. Matthew Luckiesh of General Electric Lighting Research Laboratory. To measure this hidden strain, a number of persons read a book for half-hour intervals under various lighting conditions, their fingers resting lightly on an electric push button registering the intensity of the muscles. The tests showed average human being needs 100 times as much light as he thinks he does.



NEW PUNCH CATCHES DISKS IT CUTS OUT

A NEW punch catches its own punched-out disks. The paper guide has a U-shaped spring, the lower arm of which closes a hollow reservoir where the disks accumulate. For emptying, pull back the spring with the fingernail as shown above; the disks fall into the waste basket.

WAR ANIMALS TRAINED TO ESCAPE FUMES OF POISON GAS



Rider and horse, wearing gas masks as protection against deadly fumes, are being accustomed to the apparatus in training stunts under the direction of military authorities in Germany

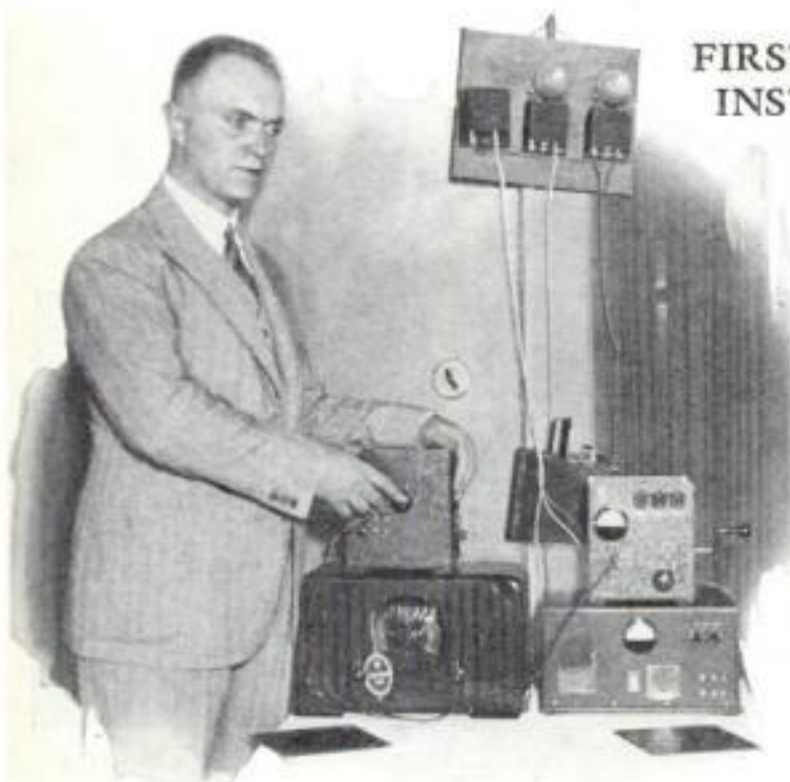
TIN SOLDIERS TEACH WAR TO CADETS

HELMETED tin soldiers, moved about like chessmen on a board, are used by German cadets to solve offensive and defensive problems of war. Tanks and artillery field pieces also are provided for the use of the young warriors. Arranging them on a relief map of some section of Europe, the cadets are required to advance or retreat with the smallest possible loss of men or the greatest territorial advantage. Military tactics are said to be acquired rapidly when realistic problems are laid out with the imitation soldiers and satisfactory solutions worked out.



FIRST RADIO FIRE ALARM INSTALLED IN GERMANY

A RADIO fire alarm system, said to be the first of its kind in the world, has just been put into operation at Wannsee, near Berlin, Germany. When a report of fire is received at police headquarters, the officer on duty presses a button that starts the automatic transmitter. The signal sent out by this transmitter sets off automatically an alarm at each fire station throughout the city. The radio alarm system is the invention of a Berlin student of radio who is the holder of many radio patents, and can be adapted for use in navigation and other fields.



Gas attacks in future wars are possibilities for which Germany is seriously preparing. Not only her citizens but also the animals used in military operations are being trained to wear gas masks. Equipment for horses, pigeons, and dogs designed some years ago has been perfected and, as the photograph at the left shows, rehearsals with the apparatus are being carried on so that, in an emergency, escape by the animals from the deadly fumes could be effected.

YOUNG INVENTOR BUILDS ROCKET-DRIVEN PLANE



Above, Lester D. Woodford and his model of a rocket-driven ship. Left, test of motor which shoots 20-foot streak of flame



AIRCRAFT propelled by rockets is the dream of Lester D. Woodford, sophomore at the Ohio State University, Columbus. For more than a year, he has been working on the model of a ship that would be driven by gasoline and liquid oxygen. At present he is on an island in a Canadian lake where the first tests with his model are being made. As intense heat is generated by the discharge of his fuel, his chief problem has been to find metal alloys that will withstand this heat without disintegrating or bursting into flame. In his model the explosive charge shoots a streak of flame twenty feet long. It is this blast that propels his ship. Trying to develop a commercially practical craft, he also feels a perfected ship could fly to the moon and back. The model carries an automatically operated parachute for safe landing.

OLD MOTOR TURNS WAGON INTO A CAR

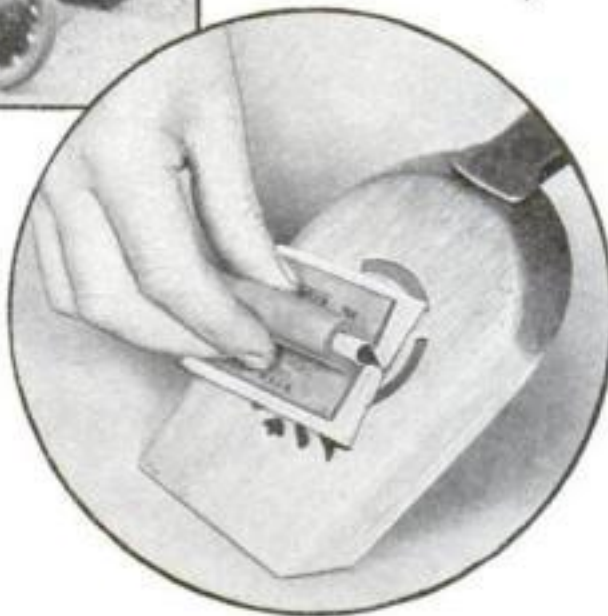


"ONE gallon of gasoline, please!" says young Stanley McCrary, of Seattle, Wash., when he stops his diminutive car at the filling station operated by his father. Parts of a discarded washing machine and a coaster wagon may be identified by a keen-eyed observer in the homemade vehicle. It represents the youthful designer's own ideas, even to the clutch and steering gear. All the work of assembling the machine was done by the young machinist. He declares that on level ground it will chug along at twelve miles an hour and runs all day on one gallon of gas.

At left, midget auto which was built by boy out of washing machine motor and coaster wagon. Holding a gallon of gas, it makes twelve miles an hour

HOLDER FOR SANDPAPER PROTECTS THE FINGERS

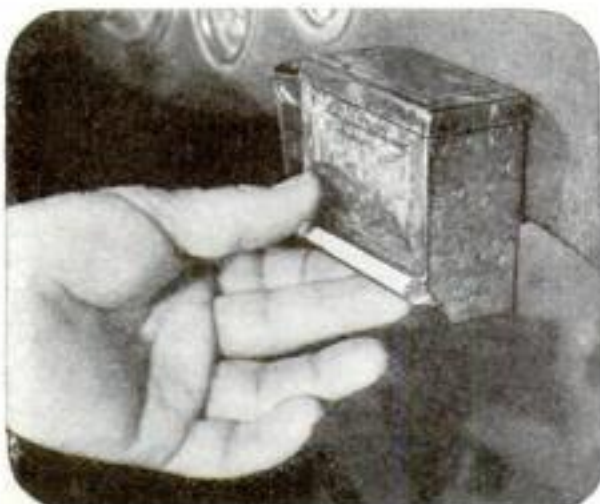
SANDPAPER or emery cloth may be used without lacerating the fingers, with the aid of a new rubber holder. Its spring grip securely holds the abrasive and permits a steady, even pressure to be applied. Bits of steel wool may also be grasped with the holder to remove rust from household utensils. Its main value lies in the fact that it cannot easily slip from the grasp, thus preventing injury to the fingers.



Sandpaper or emery cloth is slipped into this holder to guard fingers while scouring tools

CIGARETTE HUMIDOR FOR CAR FITS ON DASHBOARD

A NEW dispenser that holds twenty cigarettes is designed to be attached to the dashboard of a car, and so conveniently placed that the driver can help himself to a smoke with one hand without running any danger of losing control of the steering wheel. When a spring plate at the base is tripped, a single cigarette rolls out. The top contains a moisture-soaked pad to keep the tobacco fresh, and a removable container at the side serves as an ash tray. According to the maker, no tools are needed for installation, which requires only a minute's time.



DINOSAUR BONES FORM MONUMENT



A NEW United States National Monument is being established at Jensen, Utah, following the discovery of rich deposits of the bones of ancient dinosaurs. Many of the skeletons, some weighing fifteen tons, are practically complete. Instead of being dug out and carried away to museums, the skeletons will be left standing in relief upon the cliffs for visitors to gaze at. Experts are carving away the rock to expose them in lifelike attitudes under Dr. LeRoy Kay, of Carnegie Institution.

Tests at Department of Agriculture show a grass-green wrapper keeps potato chips fresh



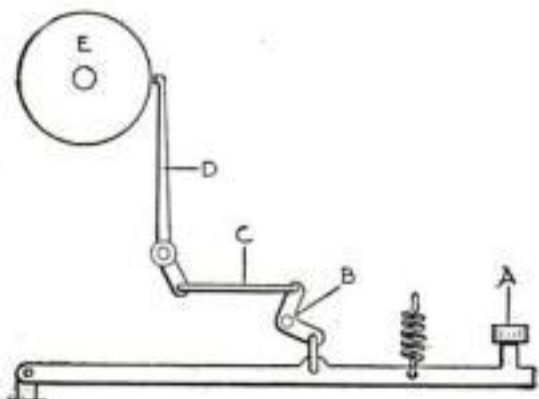
BLACK WRAPPING PAPER KEEPS FOOD FRESH

GREEN or black wrappings may soon grace many of the products on your grocer's shelves, as a result of tests just concluded at the U. S. Department of Agriculture. Seeking a way to prevent the spoilage of oil-bearing foods, which are turned rancid by the action of light, experimenters tried the effect of protective wrappers of every color of the rainbow. Grass-green and black proved the most effective, the former absorbing the chemically active wave lengths of light and the latter all wave lengths. The keeping qualities of butter, lard, potato chips, salad oils and mayonnaise may be greatly enhanced by such wrappers of cellophane and other materials, the tests showed. At the end of a year, meal in an unwrapped bottle had spoiled, while that in one covered with black paper was fresh.



Above, removing the rock to expose dinosaur bones in Utah, and sign that guides visitors

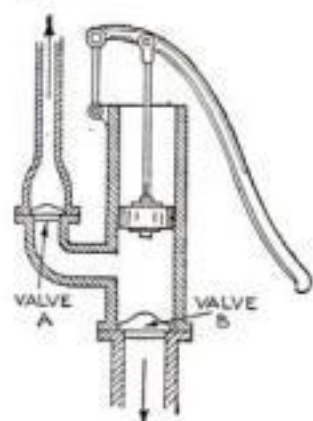
Can You Invent It?



You are asked to turn this clattering typewriter into one that makes little noise

THIS diagram illustrates the action of an ordinary typewriter. Downward pressure on the key *A* is transmitted through the bell crank *B* and the link *C* to the type bar *D*, which is shown in the act of striking the platen roll *E* a sharp blow. Let us suppose that you are tired of being annoyed by the incessant typewriter clatter that results from this construction, and have decided to invent a "noiseless" model. How would you modify the mechanism shown in the diagram in order to eliminate the sharp hammer blows of the type bars, and thus get rid of the noise caused by their impact upon the platen? Watch this space next month for the correct solution to this typewriter problem.

HERE is the answer to the problem requiring a pump design which will raise water more than thirty feet above the level of a well pump. There is no valve in the piston. When it is raised by the pump handle, the vacuum created in the chamber allows atmospheric pressure to force up water from the well twenty-five feet below. Then, when the handle lowers the piston, valve *B* closes, valve *A* opens, and the power exerted upon the pump handle will force the water to a height limited only by the strength of the downward pressure upon the piston.



Air pressure forces water past *B* on up stroke; down stroke forces water past *A*

MOVIE STORM MACHINE FIGHTS FIRE



Experimenting with a movie wind machine in fighting forest fire in Los Angeles, Calif. The powerful blast of air from the machine extinguished blaze in three out of six tests

FOLLOWING the suggestion of a Wyoming sheep rancher, officials of the Los Angeles County Department of Forestry recently borrowed a movie wind machine and found it a powerful aid in fighting forest fires. Hitherto used only to create imitation storms, the big fan turned such a blast upon a gasoline-soaked area of brush that the fire was blown out in three out of six tests, and brought under control in the others. Shoveling sand and earth into the air blast added to its effectiveness. Officials who witnessed the experiments said that one machine would halt even a forest fire at a road or firebreak.

AUTO TOWS AQUAPLANE IN NEW THRILLING STUNT

A RIDE on an aquaplane takes on new thrills behind an automobile, according to John W. Greenwood, of Oakland, Calif. This stunt may be performed on either a straight or a curved beach. The secret of the trick for the rider lies in keeping most of the weight on the offshore foot, thus tilting the plane as shown in the photograph and keeping it out from shore.



Riding an auto-towed aquaplane along a California beach is a new stunt that has given an added thrill to this popular water sport. The trick is to tilt the plane and keep it headed off shore

WORMS OF RUBBER FOOL FISH AND FISHERMEN



EVEN a squeamish novice need have no hesitation in baiting a hook with a new kind of worm—for it is made of rubber. The synthetic worms are the invention of a high state official of Colorado, and many fishermen who have tried them say that they fool fish as readily as they fool the human eye. In this style of fishing, obtaining bait is no longer a problem, as the imitation worms, shown at the left, are practically indestructible and a small number will serve for many hours of fishing.

CABINET ON ROLLERS HIDES STUDIO'S KITCHENETTE



How to install a kitchenette in a one-room studio of luxurious appointments without revealing its presence was the problem facing a New York couple. They solved it by means of a combination range and refrigerator, a sink in the corner, and a cabinet on rollers that serves as a pantry and successfully hides the kitchenette when not in use. So successfully is this done that when the cabinet is wheeled into position, stove and refrigerator disappear and the paneling on the cabinetlike screen adds to the artistic appearance of the room and visitors do not realize it is more than a studio.



Above is studio kitchenette with cabinet pantry and combination refrigerator and range. At right, the studio as it looks when the cabinet is rolled into position to hide the kitchenette



HANDLE TURNS OLD CANS INTO GOOD CONTAINERS

EMPTY tin cans need not be thrown away, thanks to modern openers that remove the top completely and leave no jagged edges. A detachable handle, just introduced, transforms them into handy containers for domestic use. The device fits cans of any size and shape, and is quickly attached with set screw and clamp.

DRAIN FOR WINDOW SILL

WHEN window screens swell tight in damp weather, rain water collecting on the window sill may seep in and stain interior wall paper. To prevent this, a diminutive rain drain has been invented. The thimble-shaped tube of copper is inserted in a three-quarter-inch hole at the bottom of the screen, and water readily drains through it. A screen excludes insects.



HOMEMADE DIVING SUIT HAS PHONE

A HOMEMADE diving suit with a telephone so the wearer can talk with his assistant at the air pump was completed recently by G. C. Wilber, of Oakland, Calif. He cut the helmet from a steel water tank and welded on a handle and an ordinary garden hose coupling for the air connection. A sheet of heavy celluloid provided a window. The user wears earphones and may talk into a microphone in the helmet. Another "mike" and set of earphones are provided for the man at the pump. A rubber suit lined with fleece completes the diver's costume. According to Wilber, the outfit keeps him perfectly dry and warm underwater.

Mike inside this diving helmet is arranged so diver can talk with his assistant while under the water



Wearing his diving suit, which has window in helmet and a phone, the diver is all ready for plunge

Strange, Prehistoric Forest Found in South America

SCIENTISTS of the Carnegie Institution recently traveled thousands of miles in search of living forests such as grew in western North America several million years ago. They found the object of their quest, veritable "forests primeval," in the mountains of Venezuela and Central America. Trees with buttressed trunks, and leaves unlike any now found in the United States, gave them a picture of the way America looked before man saw it.



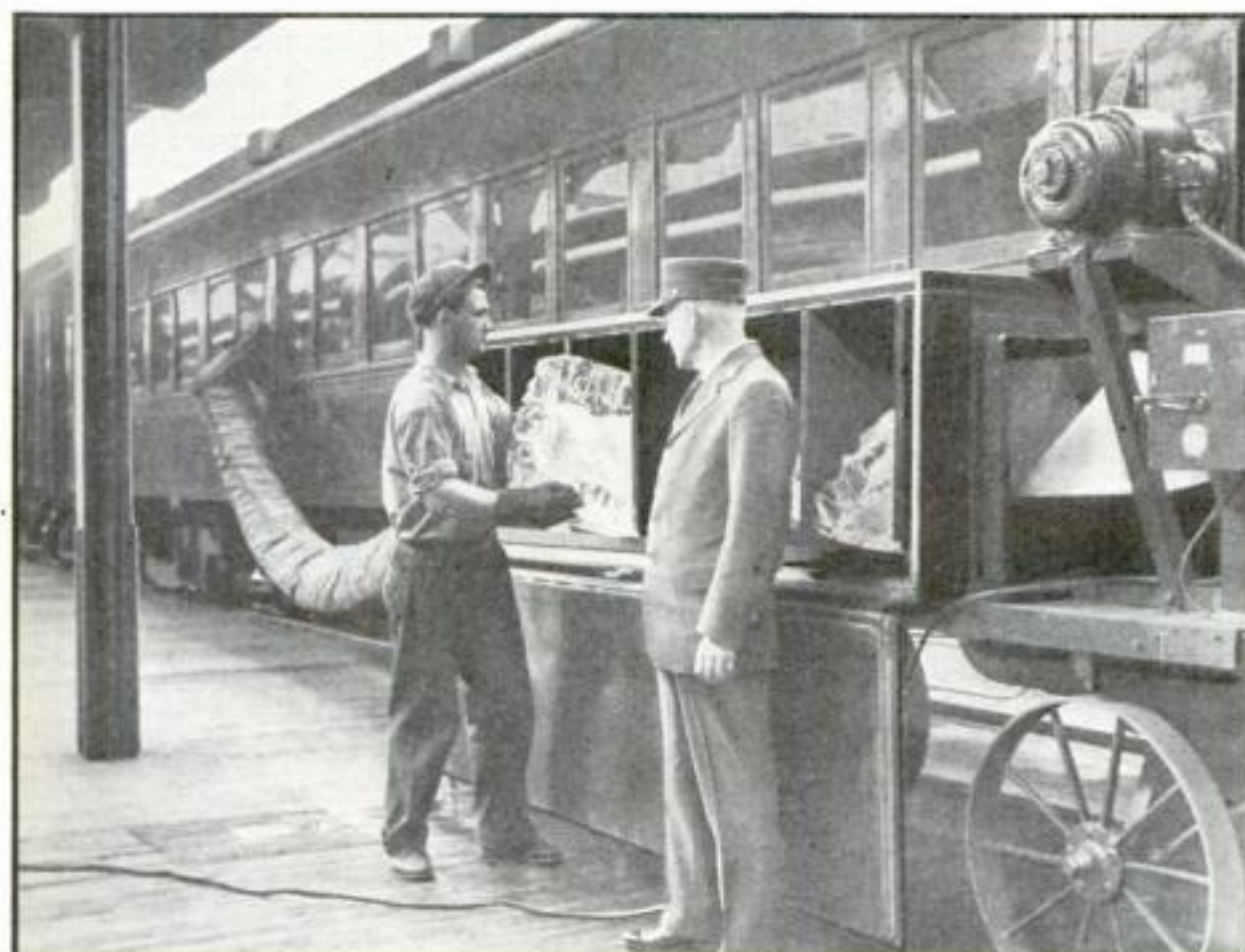
This tropical tree, found in the age-old forests of South America, has a strange buttressed base unlike anything found in the temperate zone

Erupting volcanoes, like the one shown below which is still active in Nicaragua, once destroyed forests of our country with volcanic ash



Near this native farm in the mountains of Venezuela, there are primitive forests like those that grew in our country in prehistoric times, as is proved by their relationship to our fossils

At left, view of a 100-mile road that is being cut through virgin forest in British Guiana. It was over this road the explorers traveled



A powerful blower on the truck forces air through a compartment containing 1,800 pounds of ice and then drives it through the flexible duct into the sleeping car to cool it before the train starts

USE COLD AIR BLAST TO COOL SLEEPING CAR

THROUGH a new system known as "pre-cooling," sleeping cars of the Pennsylvania Railroad are now made comfortable for travelers on warm summer nights. Before the train leaves, a blast of chill air is blown through the car for an hour and a half. This air, forced through a compartment containing 1,800 pounds of ice, is led into the car through a flexible duct.

ENGLISH ROAD TO TEST WORLD'S LONGEST RAILS

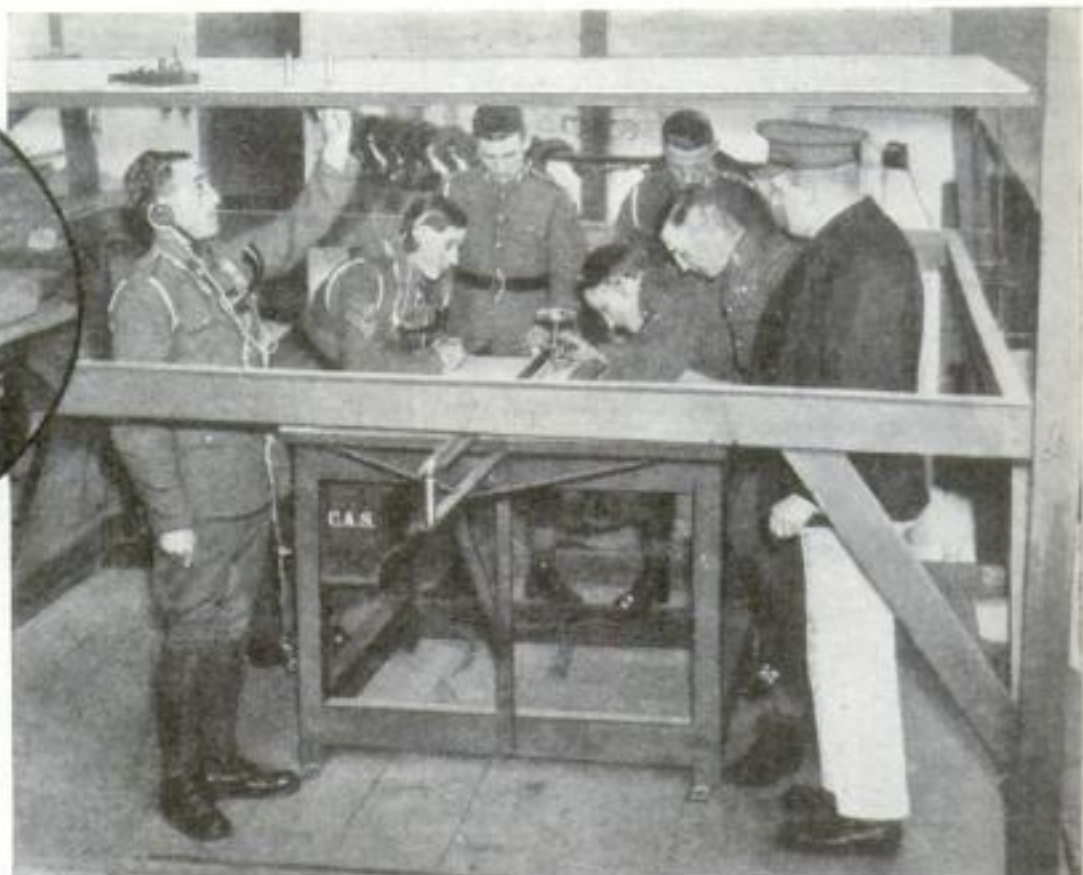
BY USING the longest railroad rails in the world an English railway company hopes to reduce to a minimum the noise and vibration in its passenger coaches. Ordinary steel rails are made in thirty, forty-five, and sixty foot lengths. The experimental rails will measure ninety feet. When a train travels forty miles an hour over a track of thirty-foot rails, both the left- and the right-hand wheels jolt over a joint between two rails 117 times a minute. On the new ninety-foot tracks, such jolts will occur only thirty-nine times each minute.

BRITISH GUNNERS STAGE SEA FIGHT IN CLASSROOM



After ship's position is observed, firing orders are given

REALISTIC battle practice is provided for British artillerymen at their Shoeburyness, England, training school. "Aerial observers" spot a model ship and transmit its position to "battery commanders." These compute the range and transmit firing orders to "markers," who thrust a peg through one of a number of holes in a board representing the ocean where calculations show the shell would have landed. If a hit is scored, the peg overturns the ship.



Beneath the mimic sea, markers hear the orders to fire and insert pegs at the points at which shells would fall. This is part of England's new training for gunners.

USE OLD AUTO TIRES AS TUGBOAT FENDERS



Old auto tires, made into tugboat fenders, are being fitted to bow of U. S. S. Koka

DISCARDED auto tires are replacing rope for bow fenders on Navy tugboats. The fender is made up of three tiers of rubber, each tier consisting of segments of the tread and side-wall of the tire. The pieces of rubber are strung onto heavy steel rods, bent to the shape of the bow on which they will be used, and hung over the bow with a short length of chain. Greater durability and less likelihood of slipping are claimed for the new fender.



NEW MEMO PAD CLAMPS TO STEERING WHEEL

HANDY for shopping lists and memoranda of errands to be done is a new auto pad that clamps upon the post of the steering wheel. Though plainly visible, it does not interfere with driving. A pencil holder and match scratcher are built into the frame of the pad.



ELECTRIC LIGHTED BAIT LURES FISH AT NIGHT

IRRESISTIBLE to fish, according to the maker, is an ingenious underwater lure that shines in the dark. The luminous device carries its own electric light, current being supplied by a replaceable battery to a standard flashlight bulb. A casing of transparent composition allows the light to shine through. One battery is said to supply continuous light for an hour.

GROWTH OF GRASS ROOTS WATCHED IN SHOW CASE

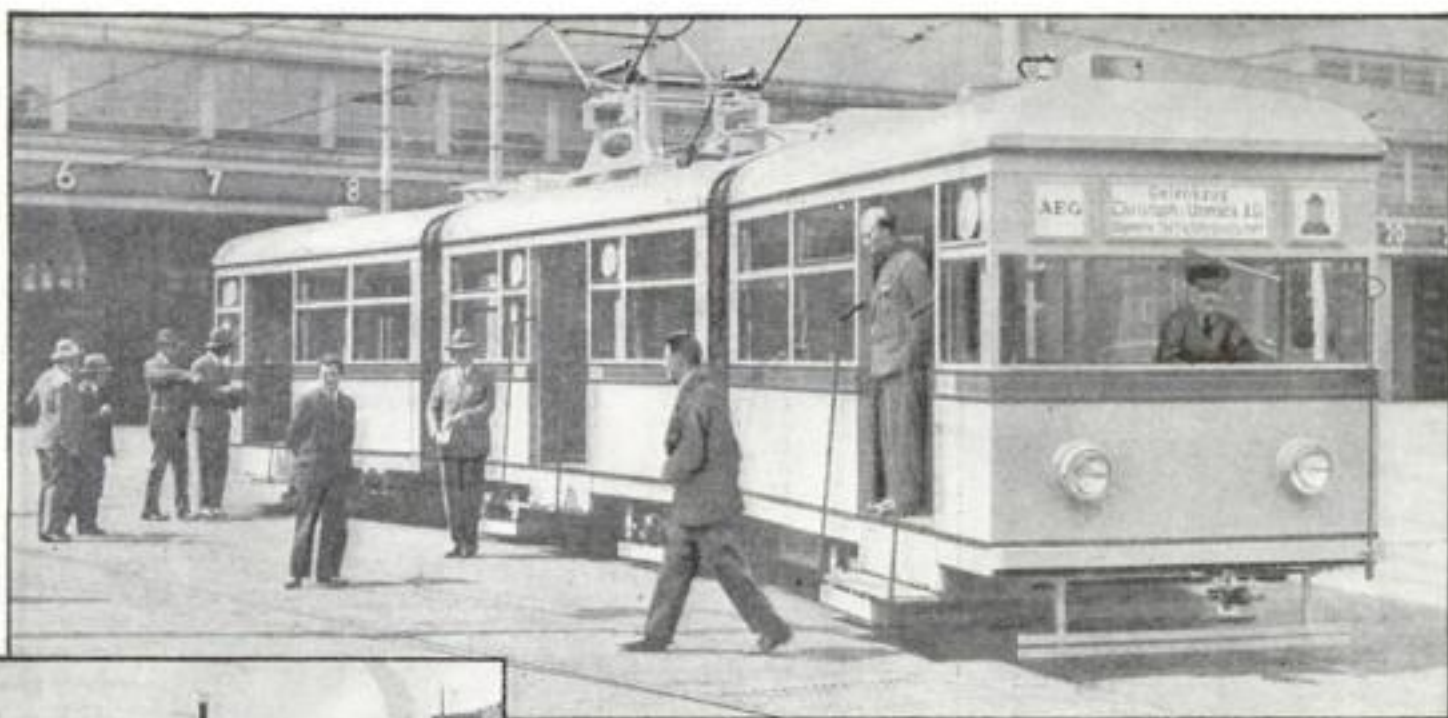
TO LEARN the secrets of the growth of grass roots, Dr. W. A. Leukel, of the University of Florida, devised a "show case" compartment that reveals what happens underground. This fifty-foot case, filled with sand, has a glass front so that the behavior of the roots may be observed. Enough rootlets approach the window to give a clear idea of their progress as a whole. With the aid of his ingenious device, Dr. Leukel learned that roots of Bahia grass, a familiar inhabitant of sandy Florida soil, sends its roots as deep as five feet in five weeks. The novel compartment also enables him to compare the benefits of certain types of fertilizers on the underground growth of plants. A section of the plant show case is seen at right.



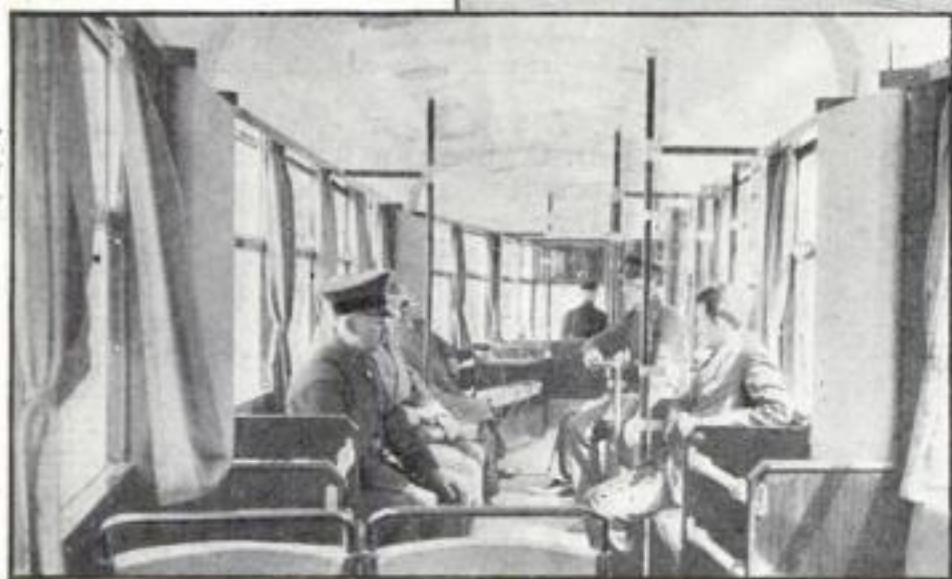
Dr. W. A. Leukel of University of Florida and the glass case in which he sees grass roots grow

New Two-Hinged Street Car Can Wriggle Around Corners

HINGED at two places, a new German street car literally wriggles around corners. It was constructed especially to fill the need for a vehicle of large seating capacity that could negotiate the sharp turns of Berlin's car tracks. A total of 105 passengers may be accommodated in the three hinged sections. The motorman is at the front and the power plant at the center of the fifty-foot car. Trial runs in Berlin showed the new design successful and practical.



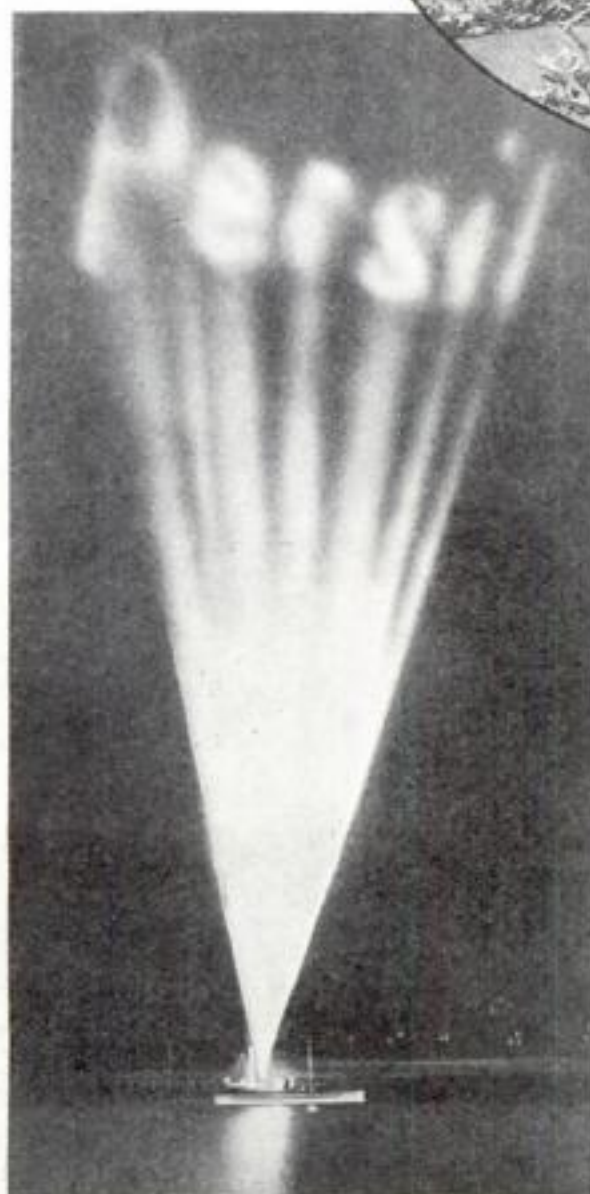
Two-hinged street car that is being tried out in Berlin where narrow streets and sharp corners make such a design highly desirable



Interior of the new Berlin street car which is built in three sections, accommodates 105 passengers, and has power plant in center compartment

FRENCH DANCERS WEAR CARICATURE MASKS

MASKS that caricature the wearer have become a fad at Parisian costume balls and receptions. The idea was introduced by Paul Poiret, famous French designer of women's dresses, and the photograph below shows him with a comic imitation of his own features. Steel nails, stuck in about the mask's chin, represent the hair of his beard. An assemblage of public notables, wearing similar masks, presents the appearance of characters from political and humorous cartoons suddenly come to life.



Searchlight projector, mounted on ninety-foot boat, writes advertisements in letters of light on the clouds above the summer resorts along the Baltic seacoast to capture tourist trade



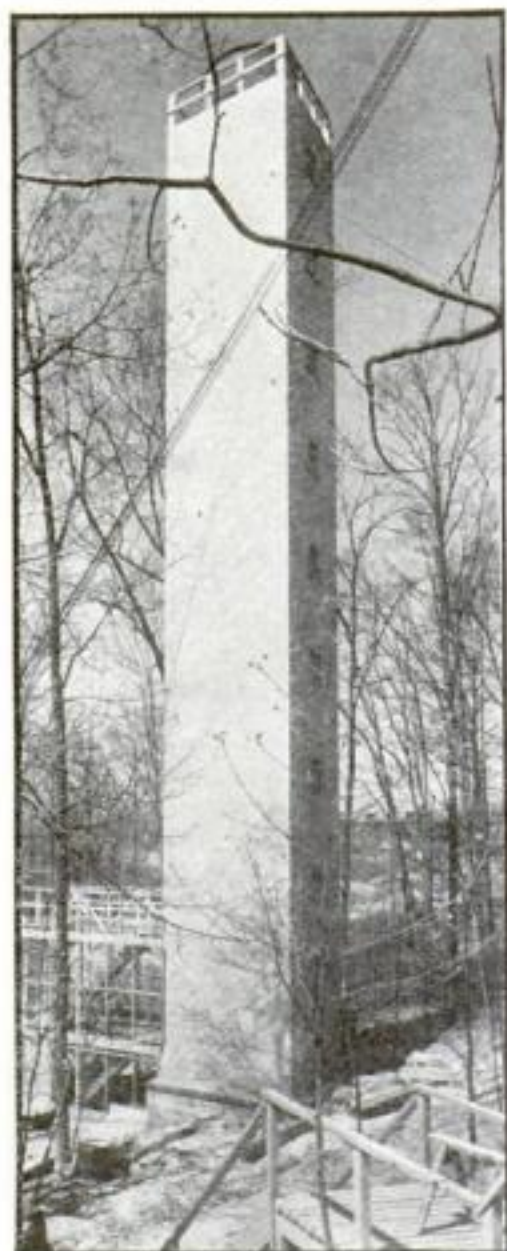
PAVE VEGETABLE GARDEN TO KEEP WEEDS OUT

SMALL fruits and vegetables are flourishing in a remarkable "paved garden" of the United States Department of Agriculture's experimental farm, at Arlington, Va. Instead of bare soil between the rows, concrete slabs or cinder blocks a few inches thick and nine to twelve inches wide are laid. The inch-and-a-half space between them gives the plants plenty of room and allows rain to seep in. The slabs conserve moisture, control weeds, and keep the soil warmer. Agricultural experts believe that the success of the experiment may set the style for gardens and even farms of the future.

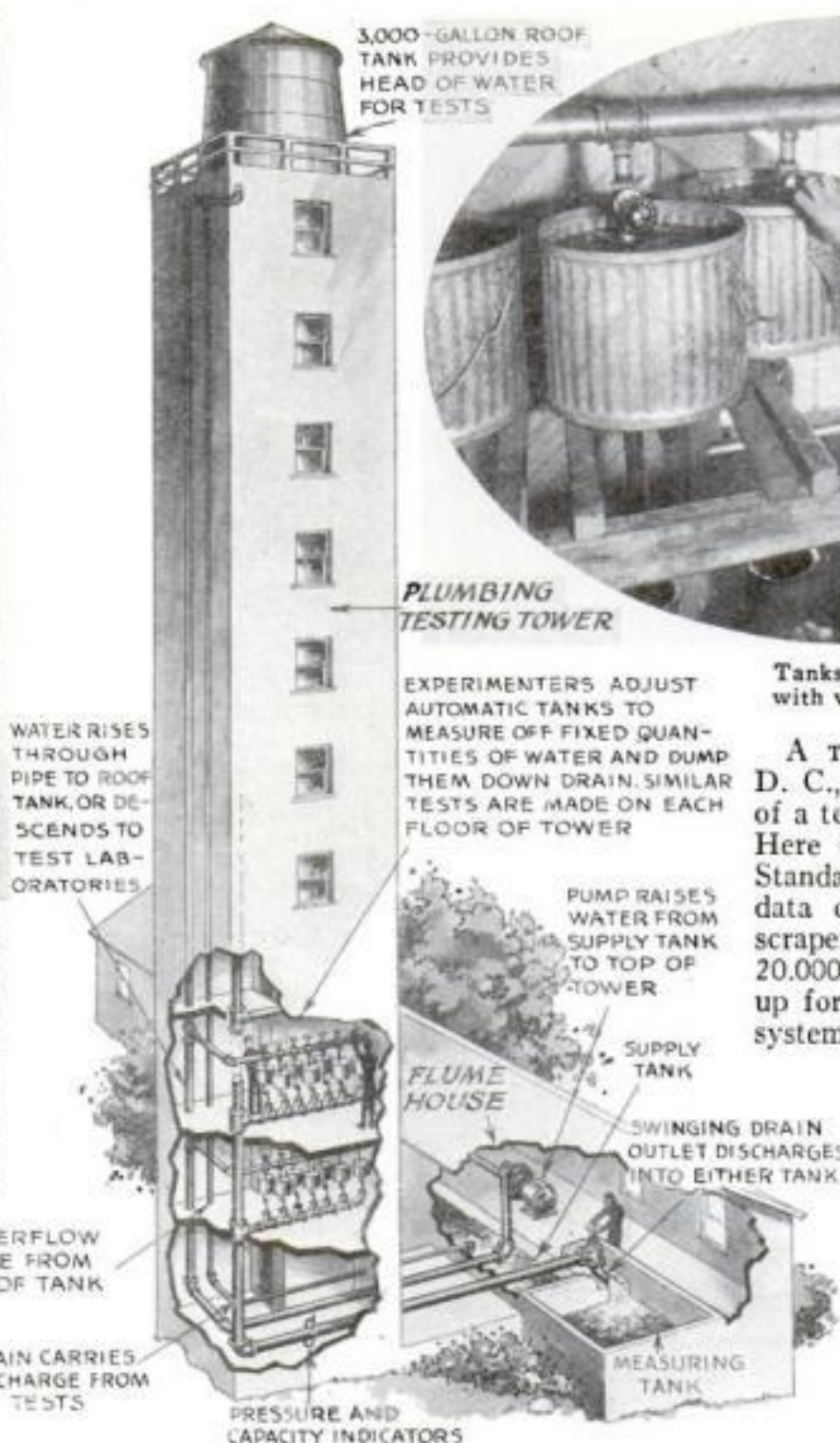
SEARCHLIGHT ON SHIP WRITES AD ON CLOUDS

TO ADVERTISE his products, a German manufacturer recently fitted a ninety-foot vessel with a searchlight projector capable of throwing words on the clouds in letters of light. Then he sent the ship on a tour of the fashionable watering places along the Baltic seacoast, where it flashes its message nightly. Similar projectors have hitherto been used on land, but this is believed to be the first sky-writing vessel to be put into operation.

SKYSCRAPER'S PLUMBING STUDIED WITH MODEL IN TOWER



In this tower, built for the U. S. Bureau of Standards, Washington, D. C., tests are made to determine the plumbing requirements of a modern skyscraper. Drawing at right shows model equipment installed in tower and how it is used to gather reliable data

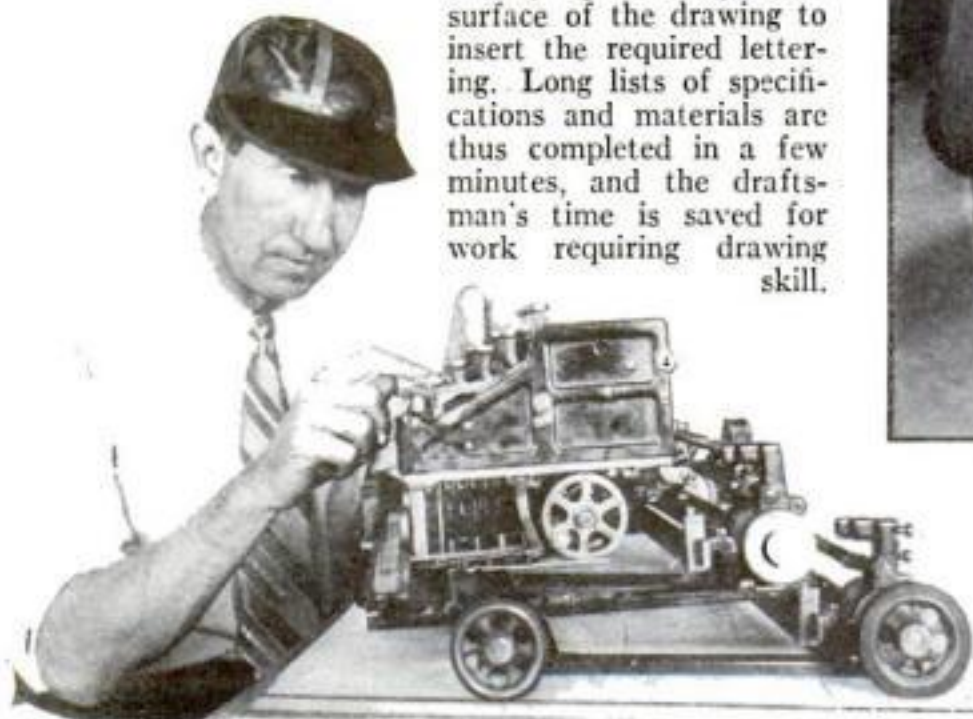


Tanks in model plumbing system are filled with water, run through pipes, and measured

A TOWER just erected at Washington, D. C., houses a full-sized working model of a ten-story building's plumbing system. Here engineers of the U. S. Bureau of Standards are obtaining the first scientific data on the plumbing needs of a skyscraper. At closing time, when perhaps 20,000 workers in a single building wash up for the day, a tall building's drainage system is taxed to capacity. To learn how large it must be, the Bureau's engineers duplicate the closing-hour rush in their model tower. Water is measured off in automatic tanks on each floor, and dumped down a drainpipe. As it empties into a measuring tank, the rate of discharge is measured with a stop watch. In this way the size of a building's plumbing may be determined from actual experiment before the structure is erected.

MACHINE PUTS LETTERING ON MAPS

NO LONGER need draftsmen place lettering upon maps and engineering drawings by hand. The laborious task of neatly inscribing names, descriptions, and dimensions with pen and ink is ended by the use of a new machine resembling a typewriter. This device rolls on rubber-tired wheels to the desired point on the drawing board, where the wheels are locked. Then its keys, operated like those of a typewriter, rap down upon the surface of the drawing to insert the required lettering. Long lists of specifications and materials are thus completed in a few minutes, and the draftsman's time is saved for work requiring drawing skill.



Machine, working like a typewriter, puts lettering on maps



SWIMMING TAUGHT WITH MIRROR

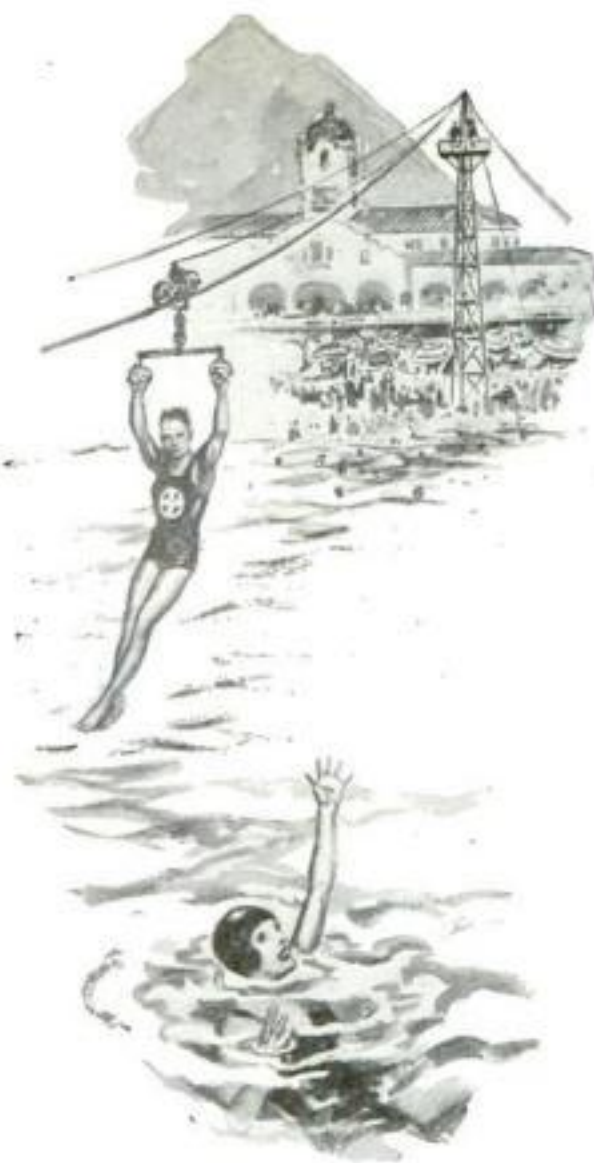
SWIMMERS at the Ohio State University watch their performances in a mirror. The looking-glass, which can be placed anywhere alongside the pool, is used by the swimming coach to help point out faults in technique. His charges, he says, have improved notably since they have been enabled to watch their own arm action.

NEW THROTTLE PERMITS KNEE DRIVING

Now you can step on the gas with your knee, if that seems most restful. A new style of accelerator for any standard make of car is mounted just below the instrument board, to the left of the driver. Its long lever is operated by a slight pressure of the left ankle or knee. This arrangement leaves the right foot free to operate the brake; and also, according to the maker, permits a more comfortable driving position.



Lever on car's left side controls accelerator so knee does driving



LIFE-SAVER SLIDES DOWN WIRE TO SWIMMER'S AID

A LIFE-SAVER may quickly reach a swimmer in need of help through a system patented by a Charleston, S. C., inventor. Instead of plunging into the water, he seizes one of several pairs of swinging handles attached to wires that radiate from his tower perch. Zipping down the inclined wire, he leaps clear at the end of the slide and quickly reaches the swimmer in trouble.



Glass rack that holds book so invalid can read

GLASS RACK HOLDS BOOK SO INVALID CAN READ

HOME invalids and hospital patients may now read in comfort, while lying on their backs, through the use of a new type of bookrack attached to the bed. The book rests face down upon a sheet of plate glass, above the reader's head, while a built-in lamp provides just the proper illumination. Pages are turned through a slot between the glass and the frame, as shown in the photograph at the left.



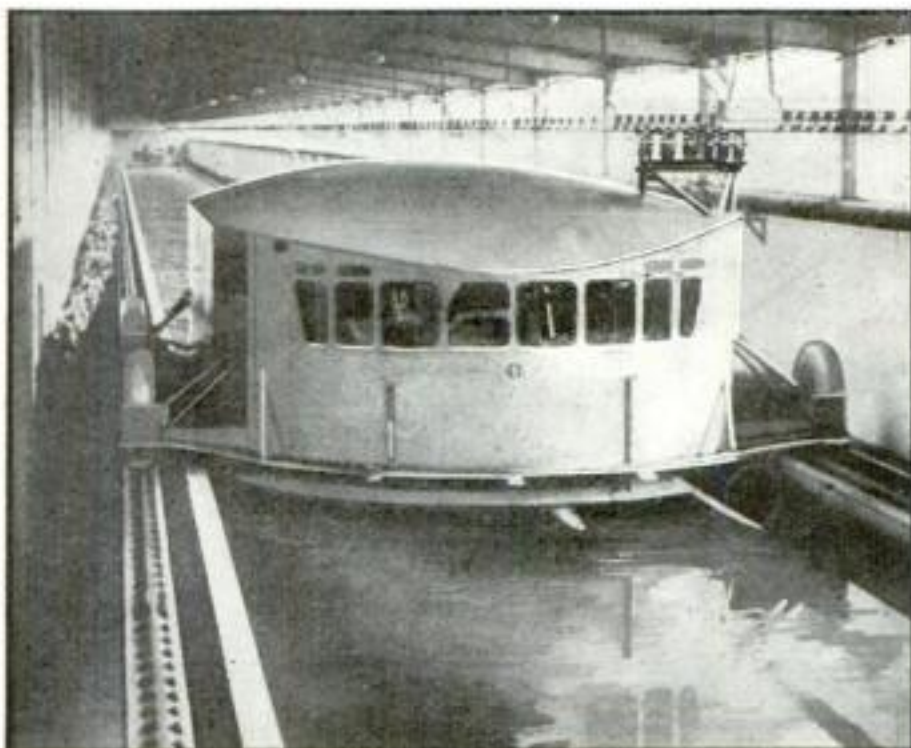
LAWN MOWER SHARPENER BUILT FOR HOME USE

LAWN mowers are sharpened in a few minutes with a handy tool just placed on the market. When it is slid back and forth across the mower, its filing surface puts a keen edge on the cutter blade. Guides automatically maintain the removable file at the proper angle so no experience is required for the tool's use.

STRANGE ENGINE TOWS HULL MODELS

ONE of the world's oddest locomotives recently went into service in Hamburg, Germany. Its duty is to tow models of seaplanes and pontoons up and down the

1,000-foot tank of the Shipbuilding Institute of Hamburg, while engineers study the relative ease with which the models pass through the water. In this way, hull shapes with a minimum of frictional drag are perfected. The strange looking engine runs on a track straddling the tank, up and down which it whisks the experimental models.



This engine tows experimental hulls in testing basin at Hamburg

CLOCK CONTROLS PLANE'S RADIO TALK



TO AVOID confusion in maintaining communication with twenty-four mail and passenger planes daily, while simultaneously talking with ground points, an airway radio station at the Chicago Municipal Airport has installed a novel clock. Its face is lettered with abbreviations designating a division of the airlines, and the minute hand successively indicates the division over which radio communication is scheduled.

Latest Helps for



SPARKLING DRINKS. Carbon dioxide gas, forced into a beverage sealed in this container, transforms it into a sparkling drink that is drawn off through the handy faucet. The tank is of steel with chromium plated head



GUARDS NURSERY. With a microphone hanging over the baby's crib and connected with a radio amplifier and a loudspeaker, every sound made in child's room, at left, is heard by its mother, below



PROTECTS THE FOOD. Meshed together, these six containers for food are fixed to a revolving base that fits easily into refrigerator

KILL MOTHS. The turning of the thumb screw on this container starts the moth spray which is put in tank under pressure so liquid is forced into all parts of a closet



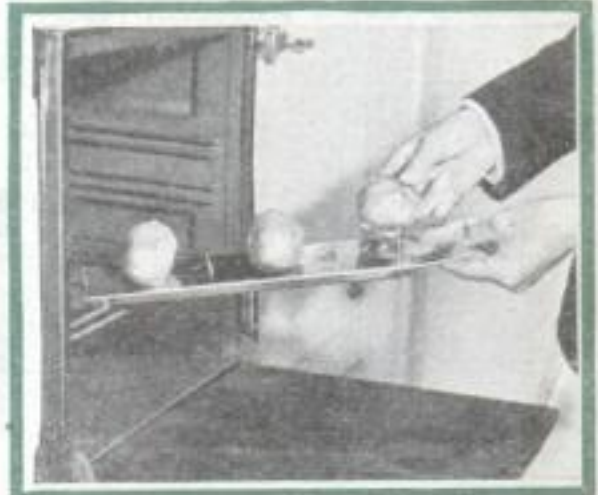
IRONING MADE EASY. A built-in electric socket for the iron plug makes connection easy with this ironing board and also helps to keep the annoying cord out of the way



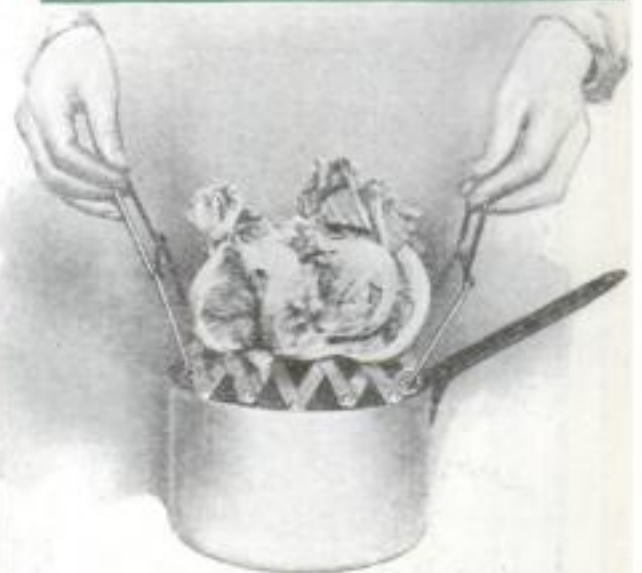
WHEAT FOR BREAKFAST. Into this machine, built of steel and finished in tinted enamel, whole wheat grains are poured. A turn of the handle brings it out as a cereal



BAKED POTATOES. Six potatoes are baked at once on the rack shown below. A potato is stuck on each prong and all put in the oven. The rack is of non-tarnishing metal



MAKE YOUR OWN WEATHER. Dry and irritating air in home or playroom is done away with when a portable humidifier is installed. It is used conveniently in any room in which there is electric connection



RACK-STRAINER. Made on the principle of the lazy tongs, the rack and strainer shown above will expand to fit any size saucepan

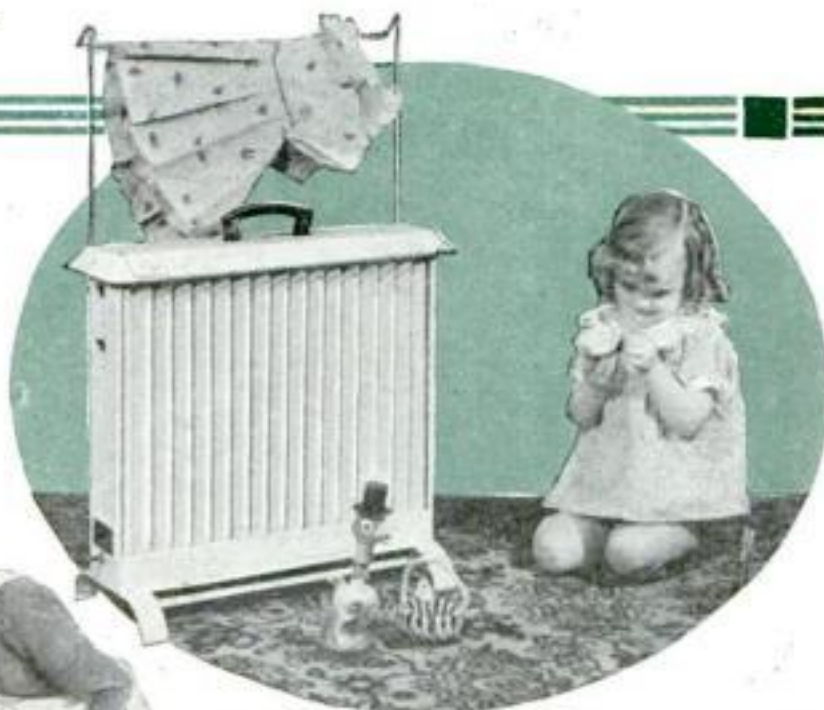
DOUGHNUTS. The container, right, is filled with dough. When the machine is held over a pan of hot fat and handle turned, shaped doughnuts drop out



the Homemaker



PORTABLE DRYING RACK. Light enough to carry around the house to any desired room is the electric dryer at right. It is provided with a rack capable of accommodating many pieces of clothing. It folds out of the way when not in use.



RIGHT OR LEFT RANGE. The ornamental range shown above and at right has, as a new feature, a transferable oven that can be placed on the left or right to suit convenience of the cook and the arrangement in the kitchen. The stove is finished in tinted enamel.



ELECTRIC MIXER. This mechanical servant is electrically operated and, in use, it is grasped by the tiny motor and the mixing blade inserted in batter or drinks which are thoroughly stirred by it. Eggs and cream are also quickly beaten by it.



AUTOMATIC BOTTLE CLEANER. No effort is needed to clean bottles with this device. The cleaner is screwed to faucet, the bottle pressed down over brush, and the button pressed. Force of the water whirls the brush.



SEALS OR OPENS. This vise-like machine hangs from the wall on a specially designed bracket. When jar or bottle is placed between the jaws a turn of the handle removes the top. It can also be used to seal on tops.



PERFUME WHILE YOU WAIT. Within this wooden garment hanger is a perforated aluminum container. When its felt pad is saturated with perfume, the odor enters clothes.



NEW WATER HEATER. Ordinary electric light bulbs use only a small part of their energy in light, the rest being wasted as heat. The device illustrated above and at right attaches to light bulb and uses the heat energy to bring water to a boiling point for household purposes. It empties itself, or may be emptied at any time.

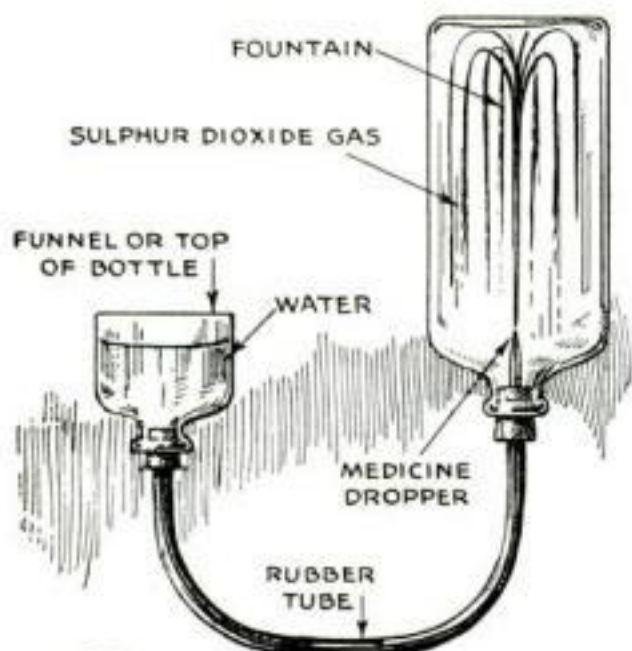


CLAMP FOR GARBAGE CAN. Refuse and papers cannot escape from garbage can and blow about the street when cover is clamped on with a rigid steel support.



LEMON SERVER. Half a slice of lemon placed in this little device is quickly squeezed dry without the danger of the juice squirting over the table linen.

WATER DEFIES GRAVITY. Sulphur dioxide gas, held in the inverted bottle, combines with the water and a vacuum is formed, thus forcing the water uphill from the funnel into the bottle. The illustration at right shows the apparatus in operation, and drawing below gives details



Experiments with Sulphur for Your Home Laboratory

WITH glass tubes, corks, bottles, and other simple apparatus, you can demonstrate some of the most interesting qualities of sulphur, the "brimstone" of the ancients, and a substance of vast industrial importance. Only a few cents worth will be required.

The original name of sulphur—brimstone, which literally means "burning stone"—suggests our first experiment.

Place a piece of sulphur on a flat stone—outdoors, of course—and ignite it with a match. It will take fire and burn with a trembling, spooky sort of blue flame and give off clouds of pale, white smoke so noxious that even a slight whiff of the

By **RAYMOND B. WAILES**

stinging fumes will cause you to choke.

This evil-smelling gas serves many useful purposes. Nearly all the electric refrigerator mechanisms of the home type are filled with several pounds of sulphur dioxide because the gas in its dry form is noncorrosive and has very suitable liquefying and evaporating temperature constants.

Sulphur dioxide gas dissolves quite readily in water to form sulphurous acid, a relatively weak acid as compared with the far more powerful sulphuric acid. Sulphurous acid is a bleaching agent and it is only necessary to hold a moistened red or pink rose in the fumes from the burning sulphur to show this property. The rose petals will quickly turn white at the edges in a manner never seen in Nature. Certain types of colored cloths, when dampened and held in the sulphur dioxide gas, also will be bleached.

In order to obtain pure sulphur dioxide for other experiments, you must make a sulphur dioxide gas generator. This consists of a plain test tube fitted with a one-hole stopper through which a piece of glass tube can be passed to make connection with a rubber delivery pipe. Place a mixture of equal quantities of sodium bisulphite and sodium bisulphate in the test tube and heat

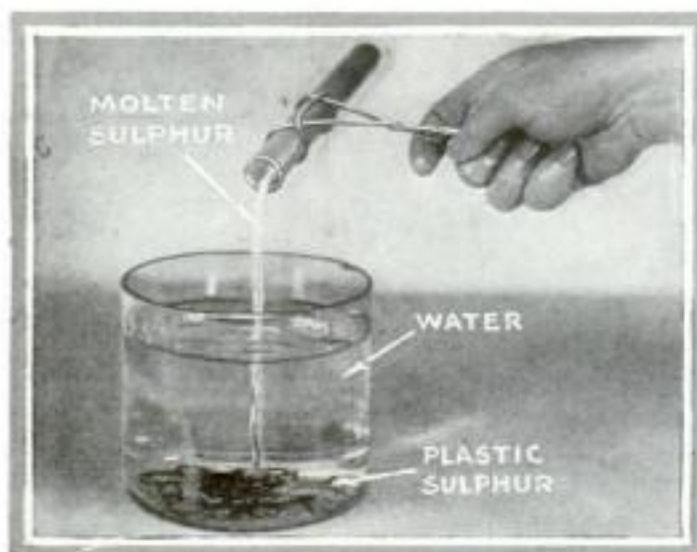
gently over a Bunsen burner or an alcohol flame. The sulphur dioxide gas will pass freely through the rubber tube. If the end of the tube is placed at the bottom of an empty bottle, the gas, which is heavier than air, will displace the latter and fill the bottle.

The fact that sulphur dioxide gas is extremely soluble in water allows you to make a magical fountain that will mystify your friends because it appears to defy the laws of gravity.

Fit a one-hole stopper containing a medicine dropper into the bottle filled with gas. Place the medicine dropper in the hole so that the narrow tip points toward the bottom of the bottle. Slip a piece of rubber tubing over the outside end of the medicine dropper and attach the other end of the tube to a short piece of glass tube passed through the cork in an improvised funnel made from the top portion of a small bottle according to the method described in previous articles.

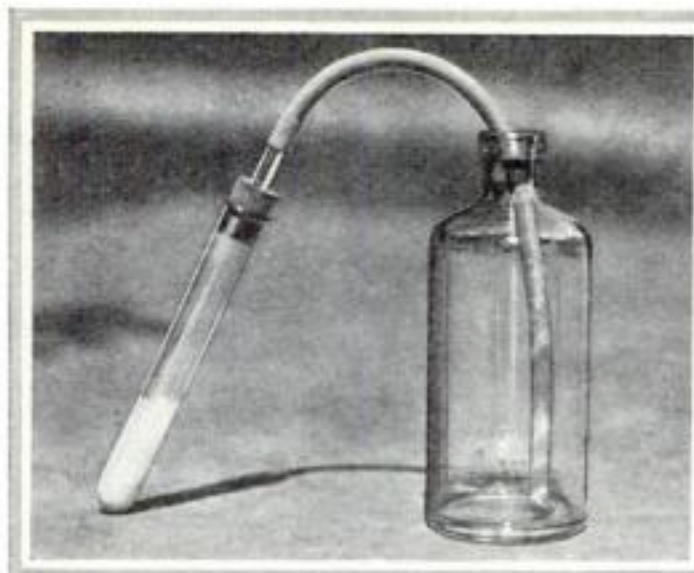
Fill the funnel with water while holding it below the larger gas-filled bottle. Now hold the latter upside down and raise the funnel till water starts to come out of the medicine dropper. As soon as the water strikes the gas it will dissolve in the water; this creates a vacuum in the bottle. The funnel can be dropped way below the gas bottle and your friends will see water continue to squirt out of the medicine dropper with considerable force.

Potassium permanganate solution has a deep reddish-violet color and can be used



When heated, sulphur melts to a yellow liquid and if then poured into water solidifies into a plastic, rubbery form that can be easily molded, like putty

Only Simple Apparatus Is Needed in Making These Valuable and Striking Demonstrations



When heat is applied to a test tube containing sodium bisulphite and sodium bisulphate, sulphur dioxide gas will pass through rubber tube. Since it is heavier than air, it will force out the air while it is flowing into the bottle.

Heated lead peroxide, right, is lowered into a bottle of sulphur dioxide gas. The brown lead compound turns to white, with a steady glow. At far right, bottle of hydrogen sulphide gas inverted over one containing sulphur dioxide gas. When they mix fine sulphur is deposited.



as a germicide because it contains so much oxygen. When a drop of the weak sulphurous acid from the fountain-in-the-bottle experiment is added to a dilute solution of potassium permanganate, the purple color immediately disappears. This reaction can be used in a chemical trick.

A pitcher of what looks like rich wine can be made by adding a small amount of permanganate to water. Several empty glasses, and one containing a small quantity of sulphurous acid, which is colorless and will not be noticed by observers, can be placed near the pitcher. The "wine" can be poured into the empty glasses and then, by quick work, you can contrive to pour the few drops of sulphurous acid back into the pitcher along with the permanganate solution from the other glasses. Then, if you fill the glasses again, the "wine" will have been turned to "water." Of course neither solution is fit to drink.

SULPHUR dioxide gas also combines with other compounds in a startling way. If a pinch or two of lead peroxide is heated and lowered into a bottle of sulphur dioxide gas, the lead compound will turn from brown to white accompanied by a steady glowing throughout the mass. The lead peroxide can be placed in a deflagrating spoon—a little spoon attached to a long handle.

Sulphur normally is a solid. In its finely divided state it is called flowers of sulphur. When heated, sulphur melts to a yellow liquid. If allowed to cool slowly it takes the hard, crystalline form, but if you pour it while molten into water it solidifies into a plastic, rubbery form. While in that condition it can be molded like so much putty, but the state is not permanent because after standing a while it changes again to the hard form.

Sulphur combines chemically with all metals except gold and platinum. Iron or copper filings, when heated in a test tube with sulphur, unite with it to form iron sulphide or copper sulphide. The reaction is accompanied by a glowing of the mass that makes the tube resemble a volcano.

The iron sulphide, which is formed in

the reaction of hot iron and sulphur, can be used to make another sulphur containing gas—hydrogen sulphide. Add some sodium bisulphate or a dilute acid to the tube containing the iron sulphide and heat. Hydrogen sulphide gas will be produced and you are not likely to mistake it for anything else, for this gas smells exactly like a rotten egg.

Hydrogen sulphide gas dissolves in water to form hydrosulphuric acid, which is very weak, like sulphurous acid. The easiest way to form it is to allow hydrogen sulphide gas to bubble through the water. This acid is unstable. If you allow it to stand for several hours it decomposes and produces a fine white precipitate—so fine, indeed, that most of it remains suspended in the solution, giving it a milky appearance. This hydrogen sulphide water will rid a dog of fleas.

Hydrogen sulphide water can be used to make several metal sulphides. Add a few drops to a solution of copper sulphate and a black precipitate of copper sulphide will be formed. Added to ferric ammonium sulphate solution, black iron sulphide forms. Similar experiments can be made with the salts of bismuth, antimony, zinc, and cadmium.

Hydrogen sulphide gas burns with a faint bluish flame. If small copper or iron wires are held in the flame till they become red-hot, they will start to burn, forming sulphides of the metals. These sulphides can be collected and heated with sodium bisulphate solution in a test tube to form hydrogen sulphide gas.

A simple experiment shows how free sulphur is formed in and about volcanoes. Prepare a bottle each of hydrogen sulphide gas and sulphur dioxide gas. Invert one bottle over the other and remove the cardboard. The gases will mix and after a while you will note that the inside of the glass is cloudy, as though it had been whitewashed. Finely divided sulphur appears white.

If you cause this reaction by placing a tube from a hydrogen sulphide generator



Sulphurous acid is a powerful bleaching agent, and beautiful markings can be produced on a red rose if it is held in the fumes of burning sulphur.

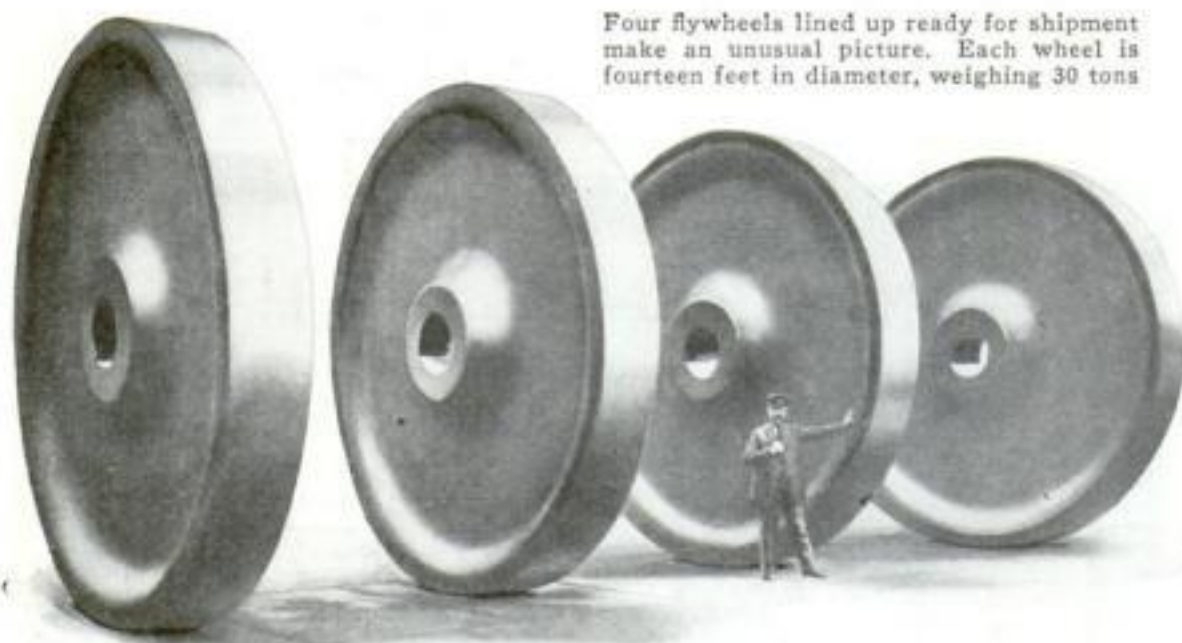
near one from a sulphur dioxide generator at the bottom of a bottle, so much sulphur will be produced that it will have the characteristic yellow color.

HYDROGEN sulphide gas also is made by heating candle wax in a test tube with powdered sulphur. If you cannot detect the presence of the gas by the rotten egg odor, wet a strip of white paper with a solution of lead acetate (sugar of lead) and hold it near the mouth of the test tube. It will be blackened, proving that hydrogen sulphide gas is being formed.

Iron cements consist of finely pulverized iron filings and sulphur mixed with water to form a paste. Such a mixture will become very hard in three or four hours.

Aluminum, magnesium, and zinc in the solid metallic form unite chemically with sulphur when slightly heated with it. Use small quantities of the substances when experimenting. A mixture of zinc dust and sulphur will ignite with a puff when touched with a hot rod. Aluminum flake, such as is sold for paints, is suitable for such tests. It combines with sulphur to form aluminum sulphide.

HUGE FLYWHEELS IN UNUSUAL PHOTO



Four flywheels lined up ready for shipment make an unusual picture. Each wheel is fourteen feet in diameter, weighing 30 tons

FOUR mammoth flywheels lined up ready for shipment made an unusual sight the other day in a German steel company's factory, and a photographer happened

along in time to record the striking picture reproduced here. The wheels measure fourteen feet in diameter and weigh about thirty-one tons.

CAR'S PARKING TIME RECORDED BY METER

FOR use in city streets where a parking time limit is enforced, a California inventor has devised a "parking meter" for installation on a car's instrument board. When the owner leaves the car he trips a lever that starts the meter operating. He may then go about his business, noting each time he passes his car how much parking time is left. Compulsory adoption of such a device, the inventor proposes, would prevent the possibility of a dispute with traffic officers checking up on parked cars.



The length of time a car is parked in restricted area is told by this meter on dash

PHOTOGRAPHER WEARS A DARKROOM

A WELL-DRESSED news photographer would wear his camera, his darkroom, and a complete finishing outfit to work, if the latest British development should set the style. All these were included in the bizarre costume of a camera man who put in an appearance during a recent sports

meet at Birmingham, England. By developing his negatives and making the prints on the spot, he was able to come back from his assignment with finished pictures ready to be rushed to the engraver for the making of half tones for the printer.



Everything was done on the spot by this photographer who went out to take pictures equipped with a camera and a completely furnished darkroom. In this way he saved much time

Cash Prize WINNERS in our June Heroes of Science Contest

Here Are the Names of Twenty-Nine Whose Skill and Application Brought Them Cash Rewards in Our Big Picture Cutting Contest in June Issue

FIRST PRIZE \$500

George Carnevale,
S. Ozone Park, N. Y.

SECOND PRIZE \$100

Edmund D. Myers,
Wilmington, Del.

THIRD PRIZE \$50

W. T. Robinson,
Philadelphia, Pa.

SIX \$25 PRIZES

Ralph D. Clark, Milwaukee, Wis.

Z. W. Gilbert, Melrose, Wis.

Eldred C. Jackson, Mt. Vernon, N. Y.

W. Norman Krell, Ft. Worth, Texas

Walter J. Quest, Nashville, Tenn.

Theodore Torrison, Robbinsdale,
Minn.

TWENTY \$10 PRIZES

John Alta, Grand Rapids, Mich.

L. Bowman, Newhall, Calif., & Henry
Mann, San Fernando, Calif.

Alvin Castle, Dungannon, Va.

P. Churat, Cambridge, Mass.

Viola Crumby, Memphis, Tenn.

Bert D. Daniels, Raleigh, N. C.

Francis X. Fralick, Toledo, O.

C. W. Glenn, Jackson, Mich.

Norman E. Goldberg, Racine, Wis.

G. W. Langer, Cleveland H'g'ts, O.

Ethel Millsbaugh, Anderson, Ind.

C. W. North, Glenbrook, Conn.

John C. Poole, San Francisco, Calif.

A. I. Riedel, Jr., Savannah, Ga.

Sue D. Runyon, Millington, N. J.

J. P. Rutherford, Roanoke, Va.

Henry Sahlmann, Brooklyn, N. Y.

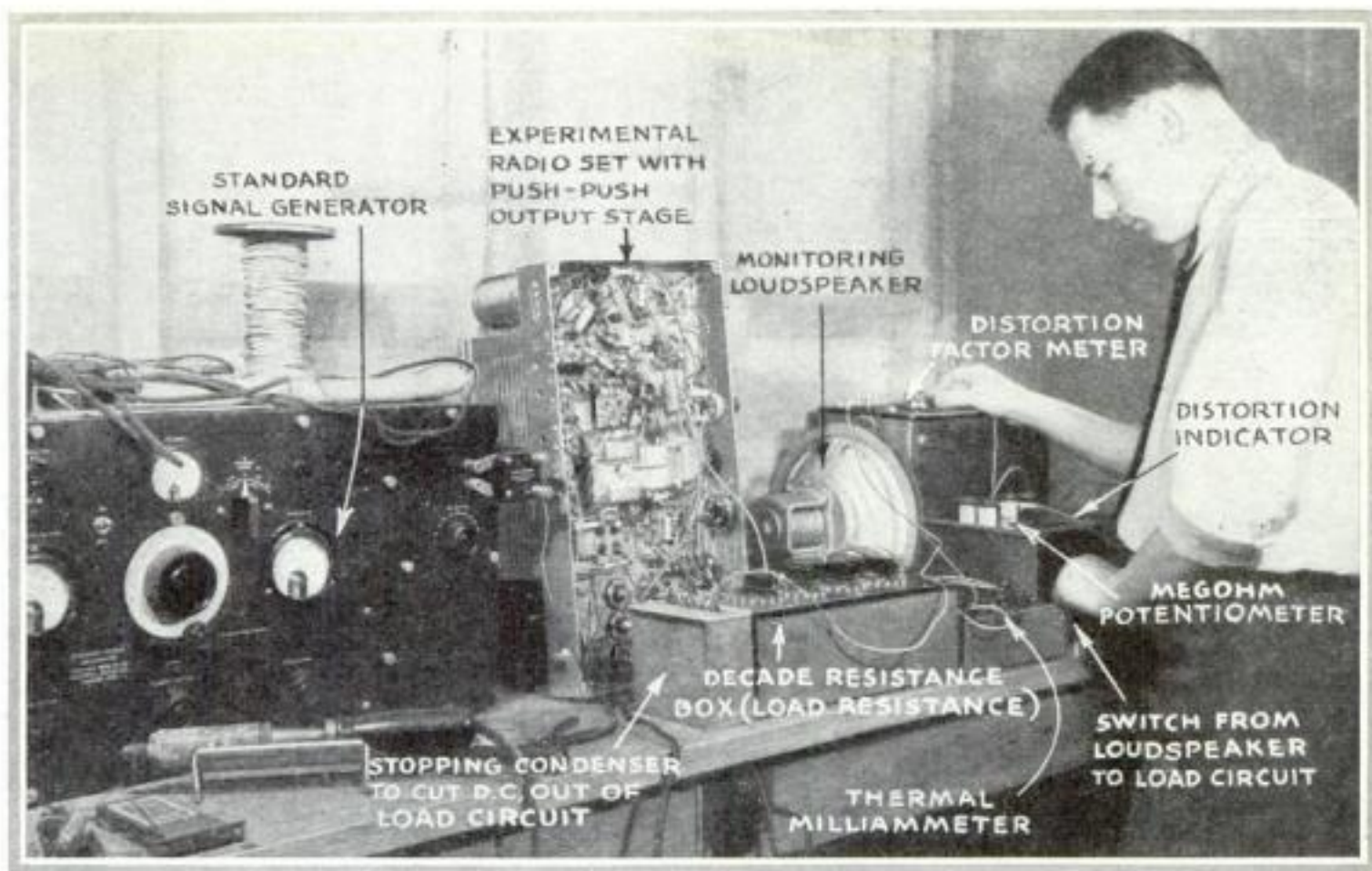
Irving Satkin, Brooklyn, N. Y.

W. Vanderbrak, Mobile, Ala.

Dorothy Walker, New Orleans, La.

By
**ALFRED P.
LANE**

With this set-up in the Popular Science Institute laboratory, the new sets with push-push circuits are tested. Results show fine tone quality coupled with tremendous volume—more than can be used in the average home



New Radio Sets *Hit High Mark*

FROM antenna binding post to loudspeaker, the latest models of radio receivers have reached an amazing degree of perfection. Radio engineers, a few years ago, never dreamed such performance was possible.

Formerly two of the most debated qualities of any radio set were sensitivity and selectivity. None of the sets of those days was all that could be desired in either respect. Some were above par for selectivity, others were better than average for sensitivity, and a few, judged by the standards of that time, were exceptionally good in both. However, when both qualities were at a maximum, the tone quality suffered.

The introduction of the screen grid tube, coupled with a deeper knowledge of the functioning of radio circuits, changed all that. Sets were made both selective and sensitive. Last year the better grades of sets reached a high standard in these qualities. This year, in the best receivers, selectivity and sensitivity are better than at any time in broadcasting history.

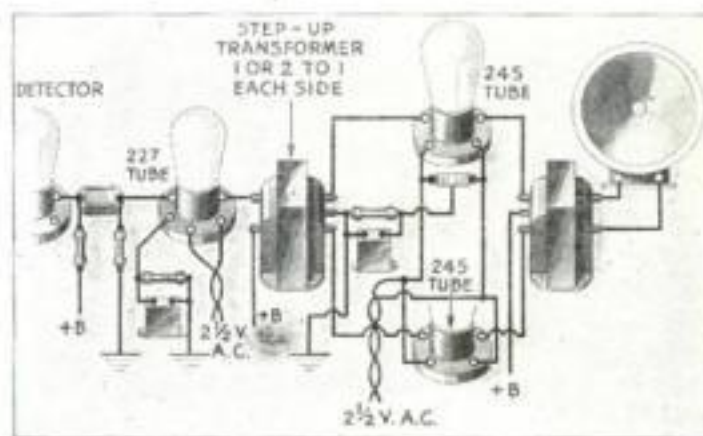
Considering radio broadcast reception

from the point of view of actual performance under average conditions, increased selectivity and sensitivity are of little importance. We had, in last year's best sets, ample selectivity. Additional sensitivity avails nothing so long as the limiting factor is the static noise level.

If you own one of last year's good sets, the theoretical improvement in these qualities will not prove impressive, but if you own a set two or more years old, the ease with which you can bring in stations and choose between those on adjacent wave lengths on a modern receiver will give you a new idea of what radio can be like.

Furthermore, the tremendous amplifying power of the new type 58 tube is such that the manufacturers have been able to make better low priced sets. Now, all but the small sets at the bottom of the price scale will give you ample sensitivity and selectivity.

With the modern set, you will notice a definite difference as you tune through the broadcast wave band. There will be less interference from voice or music and from the high pitched whistles that caused trouble even on last year's sets.



Compare this push-pull circuit with one shown below

in the faithful reproduction of voice and music, the latest sets are several degrees nearer the ultimate goal.

Improved fidelity has not been brought about so much by the use of new tubes as through refinements in circuit design that eliminate various sources of distortion. There also has been an improvement in the loudspeaker equipment of the latest receivers. In some cases, two speakers are used. In others, a single speaker of a more highly refined type takes care of the sound reproduction.

The idea of using two speakers is, in theory, excellent. One speaker is designed to reproduce with greatest fidelity the upper register of tones and the other booms forth the lower register. Tone control on such equipment becomes a simple matter. A potentiometer or other similar shifting arrangement can be connected so that one or the other speaker produces the greater proportion of sound.

It is well to emphasize that simply because a set has two loudspeakers, it does not follow that it will give the best possible tone quality. Matching a pair of loudspeakers and engineering them into a cabinet design (Continued on page 94)

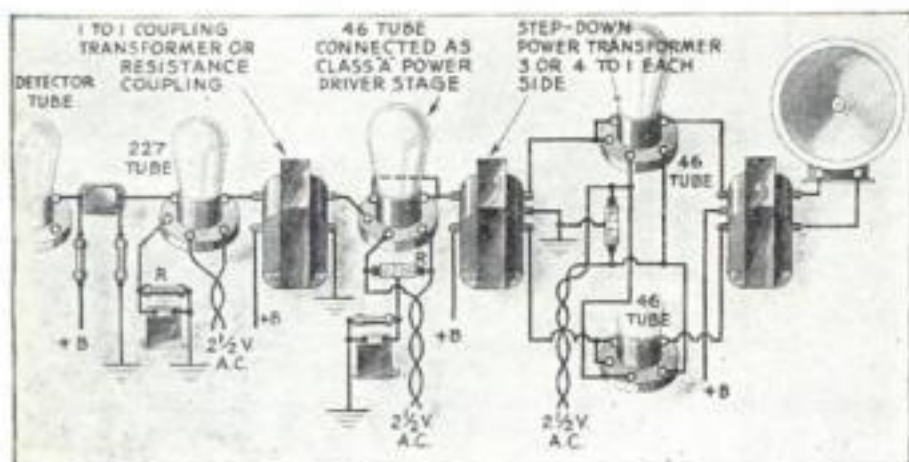


Diagram of push-push circuit showing changes from push-pull circuit

New Tone Fidelity

ALTHOUGH last year's better receivers closely approached perfection

Tune Transmitter Right

By

JOHN CARR

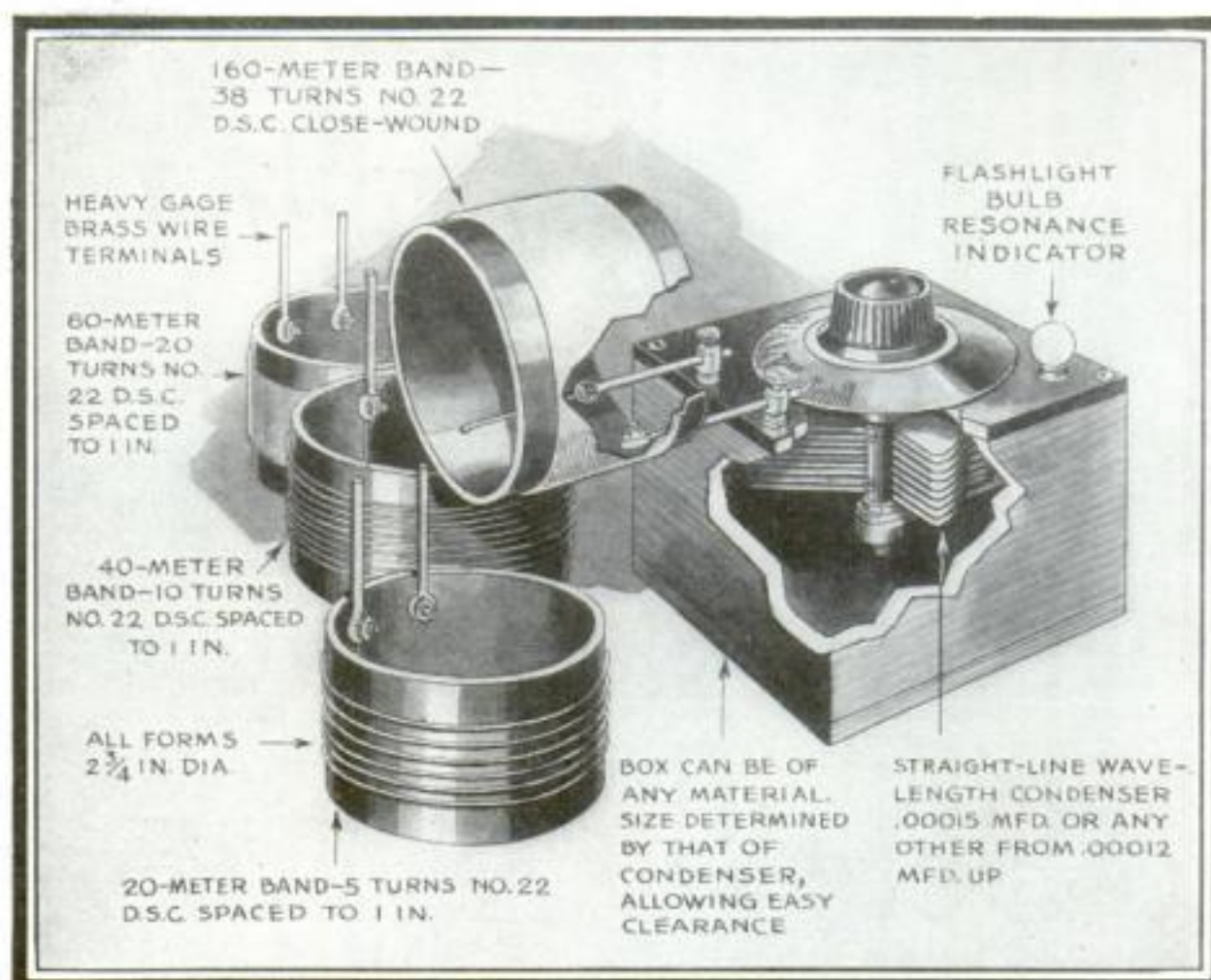


Diagram of homemade wavemeter in which condenser is protected and coils held rigidly in place

WHEN you press the key of your amateur radio transmitter, the waves it produces travel outward from the antenna in every direction with the speed of light itself. With over 25,000 licensed amateur stations in this country and thousands more in other parts of the world, you never know who is hearing your signals.

Of one thing, however, you can be absolutely certain. If you permit your transmitter to send out waves outside the bands assigned to amateurs, you are heading straight for trouble. Sooner or later the Government will spot your off-wave transmission and then unpleasant things will happen. Your licenses may be suspended for a long period or, if the case is flagrant, your apparatus may be confiscated and you may even face a heavy fine and perhaps a jail sentence.

I mention these disagreeable possibilities to impress on you the importance of correct transmitter tuning. If you take certain simple precautions you will never have any such troubles.

The simplest way to make sure that your transmitter is properly tuned is to adjust it with the aid of a factory-built wavemeter. Such an instrument will cost from \$15 to \$200, the price being determined by the degree of precision with which the wave or frequency can be measured. The illustration at the top of the next page shows a \$200 wavemeter such as is used in the Popular Science Institute radio laboratory.

For amateur uses, wavemeters costing from fifteen to twenty dollars are sufficiently accurate. All you want is to know that the waves to which your transmitter is tuned are within the allowed frequencies.

In principle, all wavemeters are alike no matter how much they cost. They consist of a variable condenser so fitted that any one of several different coils can be connected across its terminals. Each coil, covering a different wave band, is adjusted so the bands slightly overlap. You can tune the wavemeter to any desired frequency within its range.

The more expensive the wavemeter, the more carefully it is constructed and calibrated. Every precaution is taken to protect the variable condenser from accidental jars that would change its capacity and destroy the calibration. The coils, too, are wound for strength and rigidity.

MOST of the cost of these instruments goes into hand calibration, so that you can refer to a chart supplied with the outfit and tell exactly how to set the condenser and which coil to use for any desired wave.

The home construction of a wavemeter is easy. The diagram at the top of this page shows a satisfactory design, and this arrangement can be altered in any way you see fit provided the condenser is protected and the coils are rigidly held when clamped in place.

A condenser having well spaced plates is desirable, as any movement of the plates caused by jars or bearing wear will have much less effect on the permanency of the calibration than if closely spaced plates are employed.

A simple way to file a groove in a piece of composition tubing is illustrated at the bottom of this page. It makes no difference if the groove you file is a bit wobbly; the main requirement is that the wire shall not shift position after it is once in place.

The tuning range of any coil is deter-

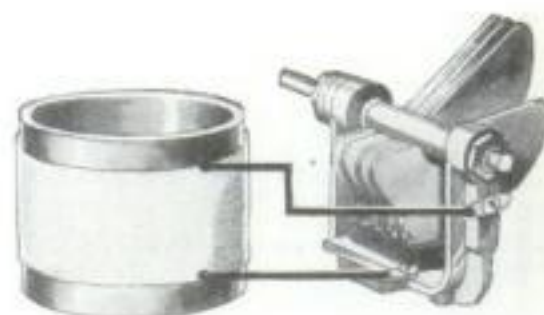
mined by the spacing of the wire and by the number of turns and the diameter.

The simplest wavemeter circuit is made up of nothing but a condenser and a coil. To the same arrangement a small flashlight bulb, as shown, is connected in series with the coil and condenser. This is the most popular circuit for a low-priced commercial or home-built wavemeter. In exactly the same hook-up a thermomilliammeter may be substituted for the flashlight bulb. Such a wavemeter will give slightly more accurate readings than can be had with the bulb.

IN ORDER to get good results in building a wavemeter, or in using a factory-built model, you must understand how the instrument works. This should be easy if you have mastered the theory of the basic operation of a radio receiver and transmitter. In each case, the oscillating circuit is made up of a coil and a condenser. In your receiver, the coil connected between the grid and filament or cathode of the tube and the condenser connected across it forms the same kind of a tuned circuit.

If you have either a radio transmitter or a regenerative radio receiver in oscillation and you bring the coil of the wavemeter near its coil, similar oscillations will be at a maximum in the wavemeter circuit.

Simple Wavemeter Circuit



This wavemeter, consisting of nothing but a condenser and a coil, gives satisfactory results



Groove filed in a piece of composition tubing to hold wire in wavemeter so it cannot shift

to Avoid Trouble

AMATEURS Need Wavemeter Described in This Article to Be Sure They Keep Their Transmitters within Bands Designated by Government for Their Use

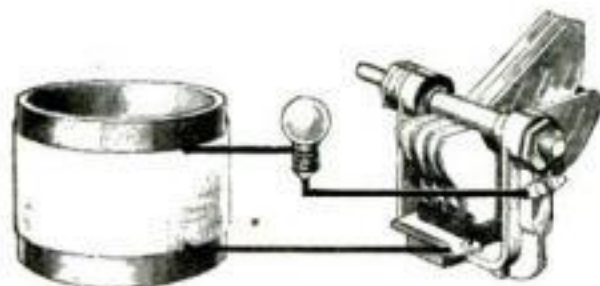
when you turn the condenser to the point where the wavemeter circuit is tuned to the same frequency as is the receiver or transmitter.

Suppose, for example, that you have your receiver in the oscillating condition and you place the wavemeter coil close to the receiver's tuning coil. Then, if you slowly turn the wavemeter condenser while listening to the headphones, you will note that as the knob reaches a certain point, the receiver will suddenly stop oscillating. Then, as you move the knob past that point oscillations will start again with the characteristic click.

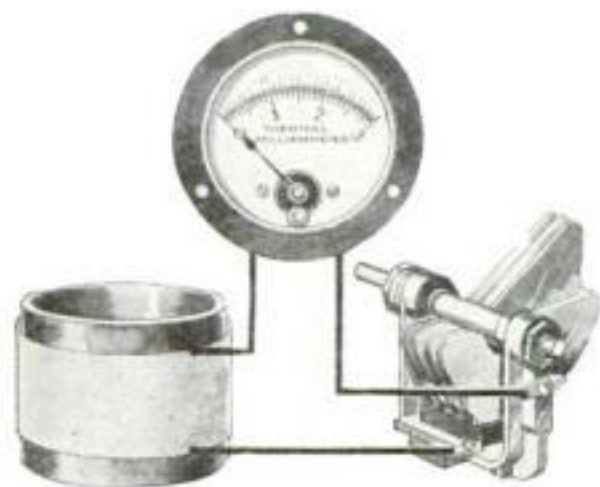
IF YOU have a calibrated wavemeter, you can read off the frequency for the point where the oscillations stop and that will be the wave to which the receiver happens to be tuned.

The effect, when you attempt to tune a transmitter to a given wave, is almost the same. However, the transmitter oscillates far more vigorously than a regenerative receiver, and the oscillation induced in the wavemeter circuit will therefore be more powerful. Enough current will oscillate back and forth through the filament of a flashlight bulb to light it. By turning the knob of the condenser back and forth you can note the point at which the bulb glows most brightly and that

Gages Transmitter Waves



In this wavemeter, a flashlight bulb is used as a guide in finding length of transmitting wave



By putting a thermomilliammeter in place of the flashlight bulb shown above, you can procure more nearly accurate wave lengths

will be the reading for the transmitting wave. Obviously, if the wavemeter shows that the frequency is not what you want, you must retune the transmitter and try again, or else set the wavemeter to the desired wave and make the necessary changes in the tuning of the transmitter.

When you first try using the wavemeter, be careful to hold the coil at some distance from the transmitter coil. A surprising amount of current flows in the closed wavemeter circuit, and if you place the coils too near each other the flashlight bulb, or the thermomilliammeter, will burn out as the circuit is brought into resonance. The most accurate reading is obtained when the separation is such that the bulb glows only dimly at the brightest setting.

AS HAS already been mentioned, the principle cost of a commercially built wavemeter goes into the calibration. You will find it easy enough to build the instrument. Your problem, too, will come in calibrating it.

The simplest and best method is to calibrate it against another wavemeter of known accuracy. If you can locate another amateur in the vicinity who has such a meter, undoubtedly he will be glad to help you.

If you cannot get hold of a meter for checking, there is still another method you can follow which will, at least, keep your wave within the legal bounds.

Your radio receiver is, in effect, a wavemeter with which you are constantly measuring the frequencies of all the stations you tune in. By listening, you probably have already located the points on the dial between which you get virtually all the amateur signals in each band, and it should be easy, therefore, to set your receiver dial at the point that represents, with reasonable accuracy, the middle of each band.

If you do this and then locate the similar wave setting for your wavemeter by the method already outlined, you can be fairly safe in saying that your wavemeter will help you to stay within bounds until you have an opportunity to calibrate it more fully and accurately.

If you follow this method in getting your transmitter tuned, try to get some other amateur whose receiver is reason-



Factory-built wavemeters cost from \$15 to \$200 each. The one shown here is used in Popular Science Institute radio laboratory

ably well calibrated to check your frequency.

The exact method of tuning the transmitter by means of the wavemeter depends, of course, on the particular circuit used in the transmitter. Assuming that you have built the unit described in POPULAR SCIENCE MONTHLY Blueprints Nos. 183 and 184, there will be two controls to adjust each time you make a change in the wave length. You must, in addition, change both plug-in coils whenever you change from one wave band to another.

THE wavemeter in any case only indicates at what frequency the transmitter is oscillating. It does not necessarily indicate that the transmitter is working at the fullest efficiency. That is why a milliammeter is desirable in the plate circuit. This instrument will show, by a fluctuation in the needle, when the two circuits (tuned plate and tuned grid) are working together to best advantage. The current flow in the plate circuit always is lowest when the transmitter is most correctly tuned and is therefore oscillating most vigorously.

After the transmitter is tuned, tune the antenna for greatest output. Be sure to recheck the wave length, because adding the antenna shifts the wave somewhat.

Remember that various stations send out standard frequency transmissions on regular schedules; the signals from these stations can be used to calibrate your receiver. For example, the Arlington time signals from NAA go out on a variety of waves. From two-fifty-five to three A. M. and from eleven-fifty-five to midnight, Eastern Standard Time, one of the frequencies is 4,015 kilocycles, which is just fifteen kilocycles beyond the edge of the amateur eighty-meter band.

How to Keep Your Car Looking New

Sunlight, Not Rain, Makes It Shabby, says Gus

By MARTIN BUNN

"WHAT in blazes is the matter with it now?" grumbled Joe Clark from his perch in the bow of the boat the two garagemen had hired to get down the lake for a few days' fishing at Whitey's camp.

"Ask me what isn't the matter with it!" his partner Gus Wilson panted as he grabbed the handle and gave the flywheel another vicious twirl. The outboard motor barked a couple of times, backfired with a thud, and then miraculously took hold.

Whitey, who had been standing on his dock watching their progress, called a greeting as Gus shut off the ignition and they drifted in.

"I'll have to hand it to you, Gus," their host smiled as he grabbed the painter and made it fast. "Nobody else can make one of Brandt's hired boats go that far without using the oars."

"Good reason why," Gus grunted. "He leaves them outdoors all the time with no protection whatever. That's no way to treat machinery. Watch out you don't get in Brandt's class, Whitey."

"No fear," Whitey chuckled. "Take a look at my new car and you'll see how I keep machinery."

"Nice bus now," Gus commented as he gazed at the shiny car standing beside the cabin. "Take care that it doesn't look and run like this outboard motor after a while."

"Where do you get that stuff?" Whitey exclaimed indignantly.

"Here I've been busting my back dragging water up from the lake to give it a wash and polish every two or three days. How is it going bad if it's kept that way?"

"That's just what I thought," replied Gus. "Too much washing and none of the care it ought to have. Trouble is, Whitey, you don't understand the difference between keeping a car in a garage and keeping it out in the open. What makes a car grow old, anyhow?"

"Why, I never stopped to think much about it," said Whitey after a pause. "Wear does most of it, I suppose, and dirt getting ground into the finish does the rest."

"You're only partly right," Gus maintained. "Of course the number of miles you drive determines the wear on the engine and running gear, assuming that you take care of changing the oil and so on. But the kind of wear that makes a car look old and shabby depends as much on how the car is kept when it's not in use as it does on the number of miles it travels."

"Suppose, Whitey," Gus continued, "you took two brand-new cars and you put one of 'em inside a glass case sealed air-tight and covered to keep out all the light and you kept it always at the same temperature. Then you put the other one out in the open



The outboard motor barked a couple of times, backfired with a thud, and miraculously took hold

where the sun could blaze on it, the rain fall on it, and the temperature was constantly changing. How long do you figure those two cars would keep looking like new? At the end of a year the car that was left outdoors would look several years old. The other car would keep on looking new till you had long white whiskers.

"The difference between a new-looking car and a shabby one is mighty little when you stop to figure it. The coating of lacquer on your car is a few thousandths of an inch thick measuring from the bare metal to the shiny outside surface. Yet the whole job looks like something the cat dragged in if a mere ten-thousandth of an inch of the outer layer gets grimy and discolored. Same way with the running gear. Let a hole form in the enamel or lacquer so small it'd take a microscope to see it, and right away moisture gets in and you've got a coat of rust."

"Well," Whitey interrupted, "what am I to do about it—go around with a microscope looking for holes in the finish?"

"Not exactly," Gus replied, "but you can keep the pin holes from starting and you can fix things so nothing will happen if they do."

"Rain, wind, dirt, and changing temperatures all put together don't do half the damage to your car's finish that strong light does. Direct sunlight is the worst because it always has quite a lot of ultra-violet rays in it and it's the ultra-violet that does the most damage. Even the light on cloudy days is harmful. You can get a bad sunburn on a cloudy day, you know, and that proves there's ultra-violet light eating away at the finish of your car."

"As a matter of fact, the more you wash your car the worse it is for the finish if you keep it outdoors all the time. At the end of a couple of years, the finish would be a lot better if you hadn't washed it at all. A thick layer of dust won't do the finish any good, but it will shield it from the light. Of course that doesn't apply if the car gets covered with wet mud. There's a lot of ammonia in some mud and that's bad medicine for auto finishes."

"Humph!" Whitey snorted.

"Looks like the finish'll go to the dogs no matter what I do. I can't make the sun stop shining and I'll be danged if I'll ride around in a filthy car!"

"I was just showing you the troubles you're up against," Gus smiled. "Now I'll show you how to lick 'em."

"First off, why keep the car in the sunniest spot in the place? You could just as well put it on the north side of the shack under the trees where it will be in the shade at least a part of the time. Next, it certainly will pay to sew up a canvas cover you can throw over it when it's not in use. Dark colored canvas will be best. Olive drab is all right. You don't have to get heavyweight stuff; the lightweight, close-woven tent cloth will do, and it isn't necessary to have it waterproofed because it's light and not rain you're trying to keep off the car."

"Speaking of light," Gus added, "there's many a fellow who has wondered why the finish on one side of his car or on one particular mudguard has gone bad before the rest of it. Nine times out of ten, the sun coming in a garage window fell on that particular part of the finish several hours every bright day. Home garage windows ought to be fitted with black shades and the shades ought to be kept drawn except when (Continued on page 93)

THE HOME WORKSHOP

MODEL MAKING : HOME WORKSHOP CHEMISTRY : THE SHIPSHAPE HOME



How to Build a Fast, Light *Canvas Canoe* OF THE KAYAK TYPE

By Jack Hazzard

Hazzard and his kayak. Many years' experience in both racing and cruising gives authority to all that he writes

DECKED canoes of the kayak or Eskimo type are becoming increasingly popular. They are especially well adapted for cruising on open water and for use at points to which it is necessary to carry the canoe by automobile. That is because their strength and seaworthiness is out of all proportion to their extremely light construction.

The kayak to be described in this and a following article is suited to open-water cruising for one man and outfit or for two men with light camping gear. Although designed primarily for use with the double blade, as are all kayaks, a skillful single-blade canoeist can send it flying with little effort.

While the Eskimo covers his craft with skin and while his canoe is usually flat-bottomed, this canoe is canvas covered and has a molded bottom, which makes it lighter and faster. It is 16 ft. long, has a beam of 27½ in., and is 11 in. deep amidships. Ready to launch, it weighs about 35 lb., yet it can carry up to 400 lb.

With double-bladed paddles, the author has driven this kayak at a 4½-mile-an-hour clip all day and has sent it over a half-mile course in four minutes, single-blade. It rides the water squarely

and runs true, which many a factory canoe does not do.

To simplify the work of building the canoe for beginners, the drawings show the frame exactly alike at both ends. Real kayaks, however, are slightly lower at the stern to counteract the tendency which a canoe under double paddles has to turn to the windward when being paddled across the wind. For this reason the author cut down the sternpost to 13½ in. (the stem is 14¾ in.) and made frame

No. 14, 5/16 in. lower than No. 2; frame No. 13, ½ in. lower than No. 3; frame No. 12, ⅛ in. lower than No. 4; and frames Nos. 11 and 5 alike. The sheer line was then put in by eye. This is a slight improvement and can be adopted by those who wish to take the extra trouble.

A 2 by 6 in. pine plank, nailed and braced to a pair of horses, is sufficient for a base timber. Lay a chalk line from end to end of the base, and along the line and at intervals of a couple feet nail 1 by 1 in. blocks 2 in. in length. Press the inner keel, which is of 1 by ½ in. oak, against these blocks, and nail similar blocks to hold the keel perfectly in line.

The outer (shoe) keel, 1¼ by ¼ in. and also of oak, is screwed to the inner keel, forming a T-section. Mark the center of the shoe, then run a line ¼ in. out from the center as a guide. With the inner keel in the blocks upon the base, adjust the shoe carefully, nail lightly, and bore for and drive 1-in. No. 5 brass screws at 1-ft. intervals, spacing them to come between the frames. Mark your stations beginning from

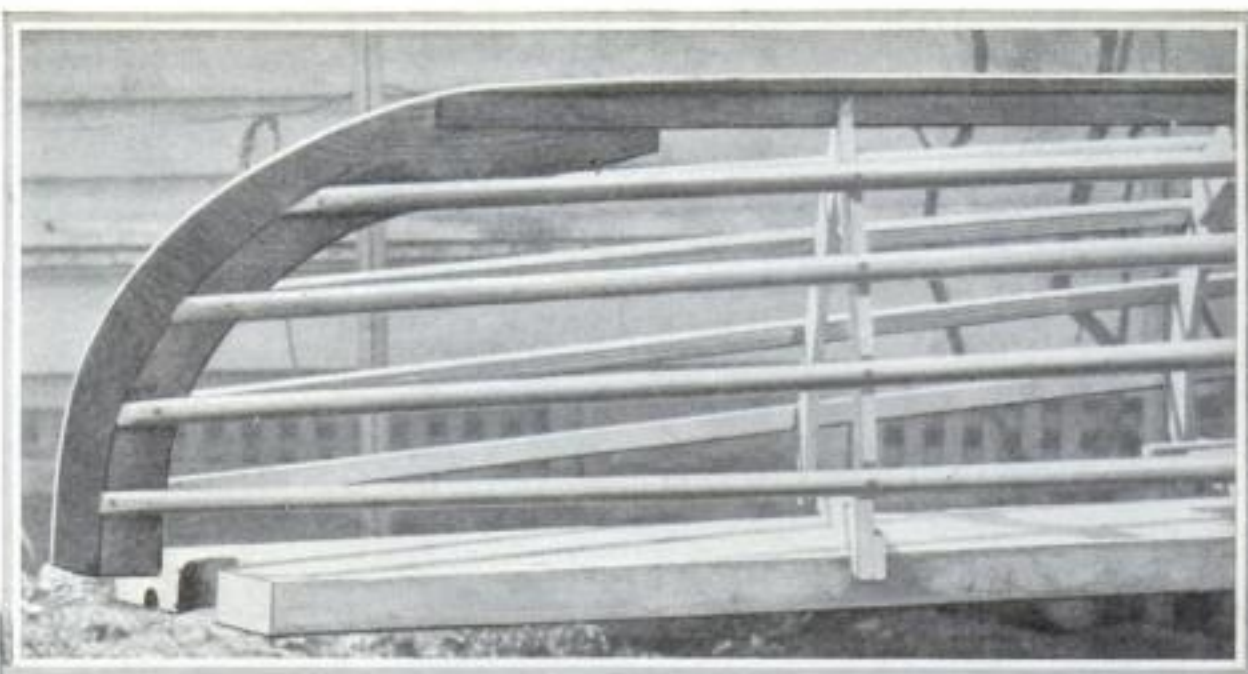
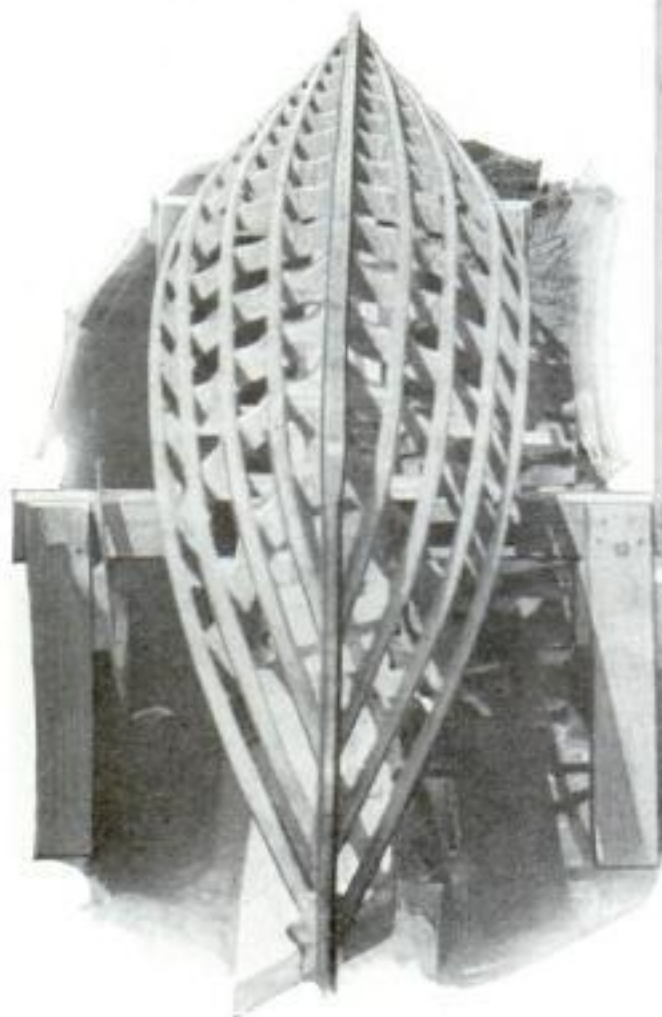
The kayak is 16 ft. long and will carry two men with light camping gear, yet it weighs but 35 lb.



Kayak Blueprints and Patterns

COMPLETE working drawings for the kayak and its double-bladed paddle, leeboard, sail, and canoe tent can be obtained by sending 75 cents for POPULAR SCIENCE MONTHLY Blueprints Nos. 192, 193, and 194 (use coupon on page 80). Full size patterns of the frames, stems, and paddle also are available. They will be drawn to order on large sheets of paper from Mr. Hazzard's own templates for \$1.50. The price of blueprints and patterns together is \$2.25.

Right: A close-up of the rabbeted stem with longerons attached. **Below:** View of bottom before fairing the stations and adding wales



the center, remove the shoe, and turn the keel over for application of the stems.

Stems may be made in several ways. If the stem is cut from a plank, lay the grain horizontally through the upright part and strengthen the stem by the insertion of $\frac{3}{8}$ -in. hardwood dowels, overlapped as shown. A more favorable slant of grain is obtained by joining two pieces with a scarf joint, but be sure the joint is tight, well glued, doweled, and screwed from the inside. A natural crook of the grain makes the best stem.

The easiest method is to saw the stem from one piece with a compass saw. Mark the position, depth, and angle for each dowel on the side of the piece. A pencil mark on the bit will tell you when you have gone deep enough. It will be necessary to gouge out the inner side of the stem in order to start some of the holes. Cut the dowels an inch or more longer than necessary and run a clear-cut indentation along one side of each to allow the escape of air. Coat with waterproof glue and drive firmly. Cut off the projections when thoroughly dry.

Mark the exact center of the cutwater and run lines $\frac{1}{8}$ in. each side of the center. At a distance of 2 in. from the outside of the stem, run a line marking the rabbet or recess in which the longerons (to steal a word from airplane parlance) will fit. Lay the stem on the bench and cut along the rabbet line with a sharp chisel, working the wood aft of the line to a depth of $\frac{3}{16}$ in. The cut should run in at an angle somewhat less than that at which the longerons and wales will meet the stem. Sharpen the cutwater by planing the stem to taper from the rabbet to the lines already marked on the outside of the stem.

That the stem may be truly perpendic-

ular when mounted, saw the joint for the keel with care and see that the keel itself is true. Drive 2-in. brass screws through the keel into the stem, and bore holes and drive 1-in. screws from the stem into the keel.

All the frames are cut from $\frac{3}{8}$ -in. fir plywood of the waterproof variety. You will need full size patterns for the frames. These can be obtained from **POPULAR SCIENCE MONTHLY** or, if you wish, you can draw them

yourself on large sheets of wrapping paper.

Lay the pattern of frame No. 8—center frame—on the wood and nest frames Nos. 7, 6, 5, 4, 3 and 2 within, leaving only sufficient room for cutting. Mark carefully to avoid distorting the patterns. Cut the frames out with a fine toothed compass saw or a power jig or band saw. Coarse toothed saws or rough, fast sawing will splinter the plywood excessively.

Start with frame No. 9 and repeat the process. Disregard the flutings between the landings for the longerons until each frame can be handled separately.

Saw out cross members $\frac{3}{4}$ in. wide for all frames. Nail and glue these in place, clinching the copper nails tightly. Mark the exact center of each carline as a guide

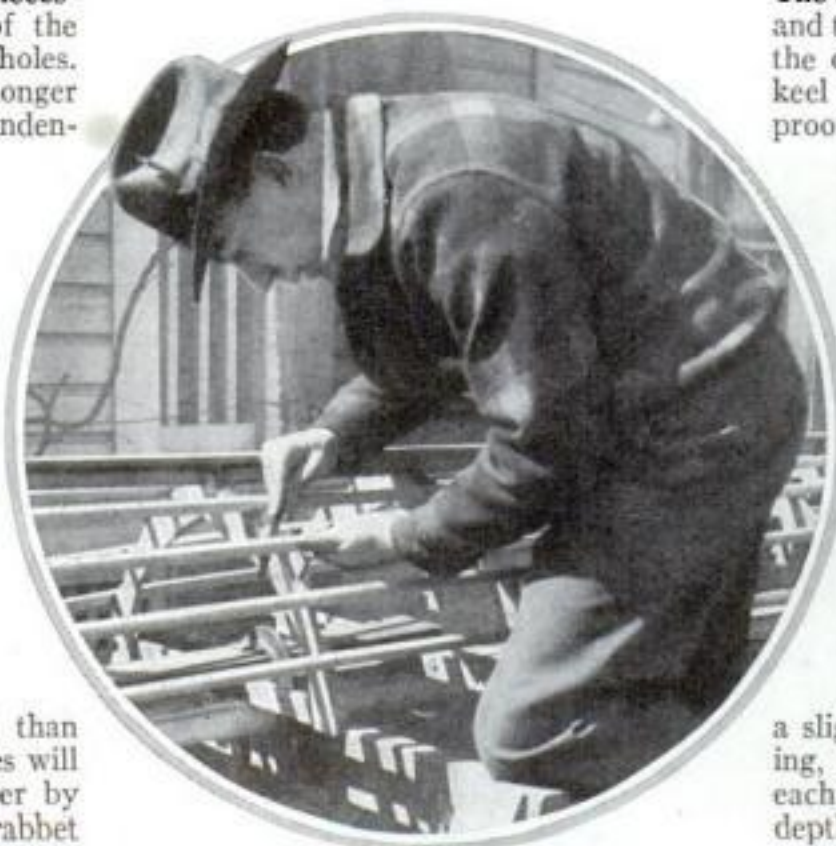
to be referred to during construction.

As frames Nos. 5 and 11 carry the ends of the cockpit, the carlines are specially constructed. There is a strip each side of the frame, strengthened by small blocks of plywood glued and nailed between. Frames Nos. 6 and 7 are provided with triangular gussets extending inboard to carry the incurving portion of the cockpit coaming. A filler piece the width of the carline is glued between gusset and carline to provide a $1\frac{1}{8}$ by $\frac{3}{4}$ in. face against which to screw the coaming.

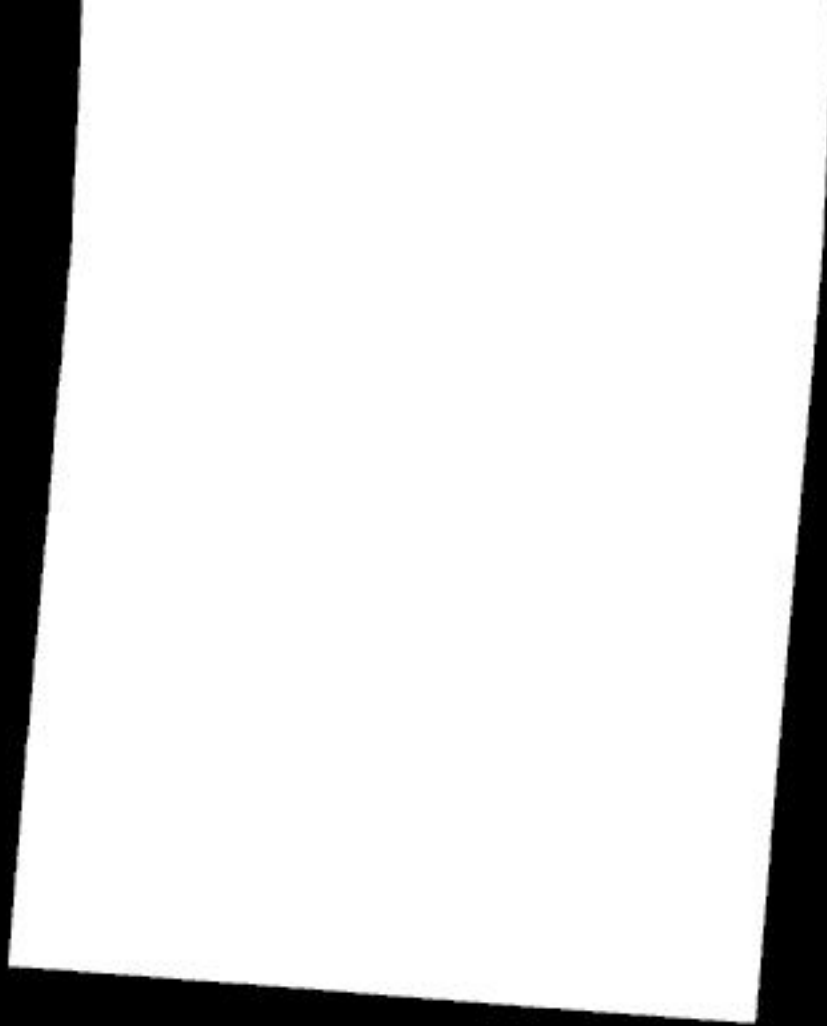
Frames Nos. 3, 4, 5, 8, 12, and 13 are reinforced at the keel with triangular facings nailed and glued on one or both sides. Glue on pieces of sufficient size and saw them to shape when the glue is dry. Frames Nos. 6, 7, 8, 9, and 10 are fitted with $1\frac{1}{4}$ by $\frac{3}{4}$ in. strips opposed to the carlines; and the top of the frame is widened or a small filler block inserted to provide a substantial face for fastening the coaming.

If the slots for the keel have been carefully sawn, both for fit and trueness, mounting the frames on the keel will be an easy task; but if the cuts are not true, some little adjustment will be required. The frames are spaced at 1 ft. intervals; however, there will be from 18 to 24 in. between the stems and the nearest frame. The bulk of the stems and the breasthooks and the close spacing of the longerons make the omitted frame unnecessary. Paint the keel and inside of the slots with waterproof glue (casein), and wedge, brace, and clamp the frames in position and allow the glue to set. It is a good plan to tack a light batten along the carlines on the line indicated by the center marks, using a plumb to make sure that the center marks are truly over the center of the keel. Turn the frame over and drive a 2-in. No. 6 screw through the keel into each frame. Replace the shoe keel.

Remove one line of keel blocks, press the edge of the shoe against the remaining blocks, and block the frame in place again. Because of the downward thrust contributed by the longerons and because a slight lift is desirable to facilitate turning, block up the keel just at the foot of each stem with a 1-in. block grooved to a depth of $\frac{1}{4}$ in. Nail short pieces of $\frac{1}{4}$ by 1 in. wood from the sides of the base to the frames in various places to help hold the frame firmly in place, and clamp the



Cutting a station slightly lower with a hacksaw blade. No matter how accurately the frames are made, some slight fitting is always needed



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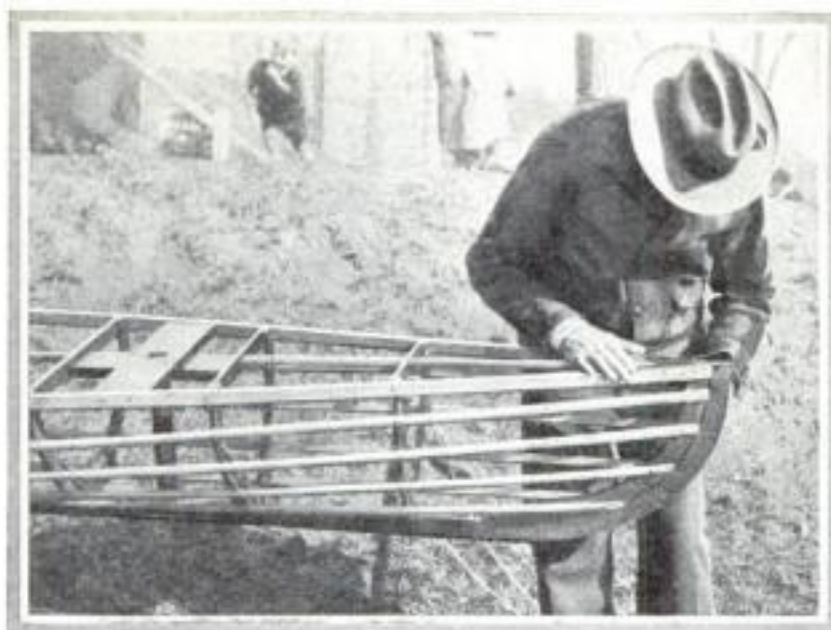
center of the keel to the base with large C-clamps.

The top longerons go on first. Using the ever handy clove hitch, tie the pair loosely to the center frame, then bring the ends in and tie to the stems, thus bending the strips about the flexible frame without distortion. Tie in place at each station. Sight to see that there are no sudden dips or curves and that the pieces lie parallel to each other in a long sleek curve from end to end. Removing a station or two at a time, place glue in the joint, and drive a thin nail to hold the strip in place. Where the bent longeron is strong enough to require close nailing, drive the nail first through a small piece of soft wood. The wood can be split off to permit easy withdrawal of the nail.

After the glue sets, the nails are removed and 1 1/4-in. No. 6 screws are driven to make the joint secure. In boring for these screws use a small drill first, say 1/16-in., and follow with a 1/8-in. drill through the longeron only. Countersink all screws below the surface line and cover the heads with a plastic wood composition.

Some of the stations may be found too low or too high for a perfect curve. Either lower the stations on either side or raise the low station by inserting a well-glued block.

Fitting the longerons to the stems is best done with a jackknife. The strip must be nearly 1/4 in. longer than at first appears necessary in order to fit snugly in



Fitting the breastplate, stem head, and painter ring, which are made of sheet brass and later screwed on over the canvas

the rabbet. Cut away the underside until a rough fit is obtained, then rub the stem at the point of contact with a soft pencil, bring the longeron in touch, and move it carefully up and down with firm pressure. The high spots will be marked with lead and can be whittled away. Scrape off the lead, apply glue, and screw permanently.

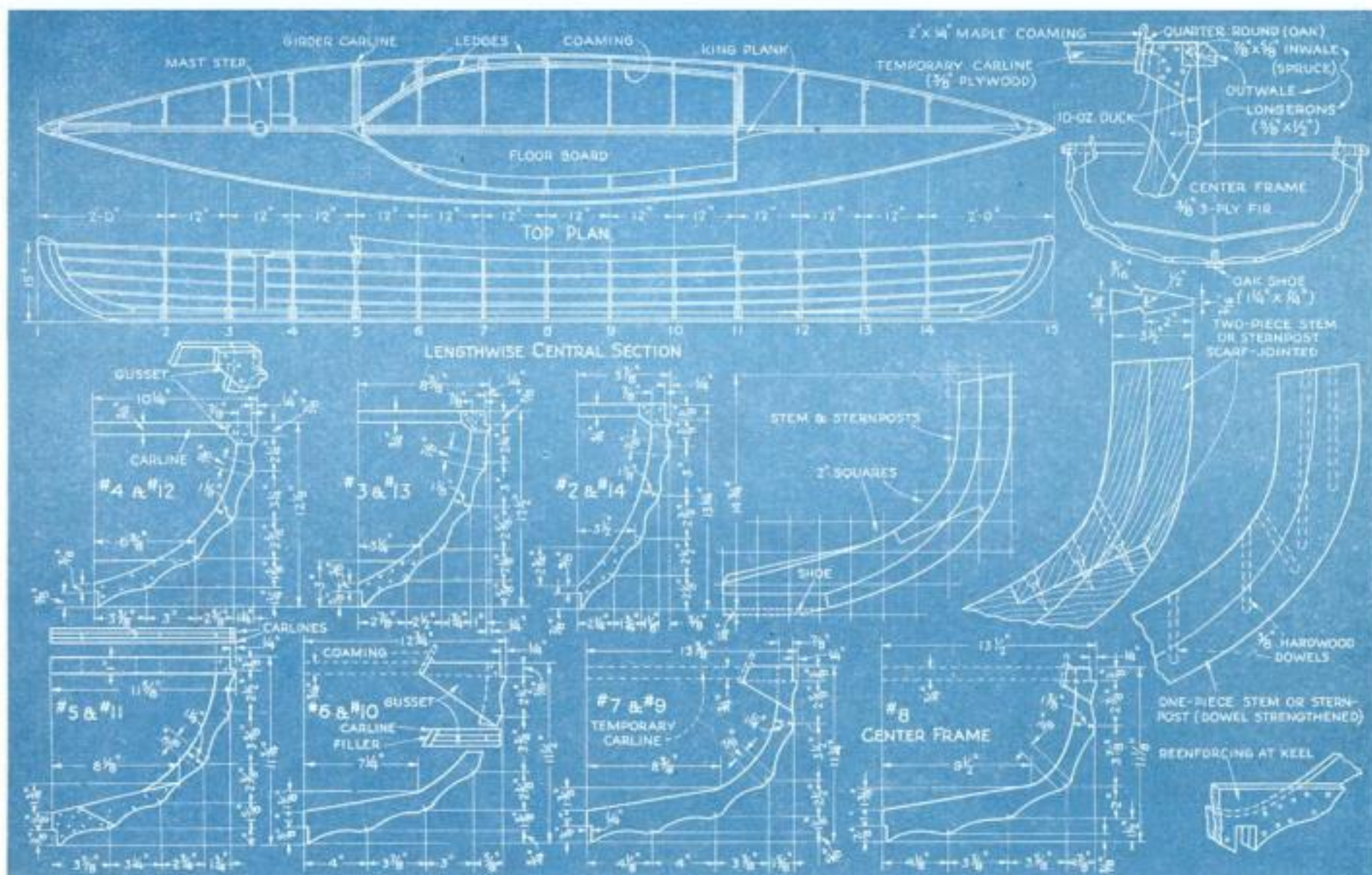
Each pair of longerons should be fitted to the stems at the same time, for if unequal pressure is exerted the stems may be canted to one side. A plumb line hung from the stem head will not be in the way and will act as a check. Plane the longerons to a long slant, tapering into the cutwater without perceptible hump. Screw heads should be well sunk to permit tapering.

Placing the remaining longerons is merely a repetition of the process.

How to fit the wales and finish the framework will be described next month.

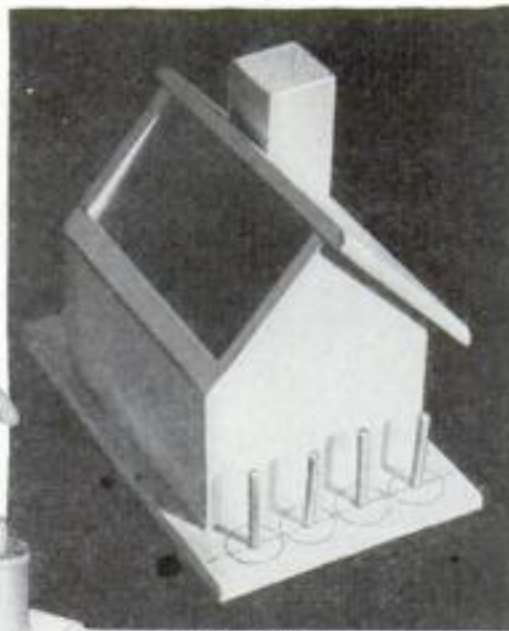
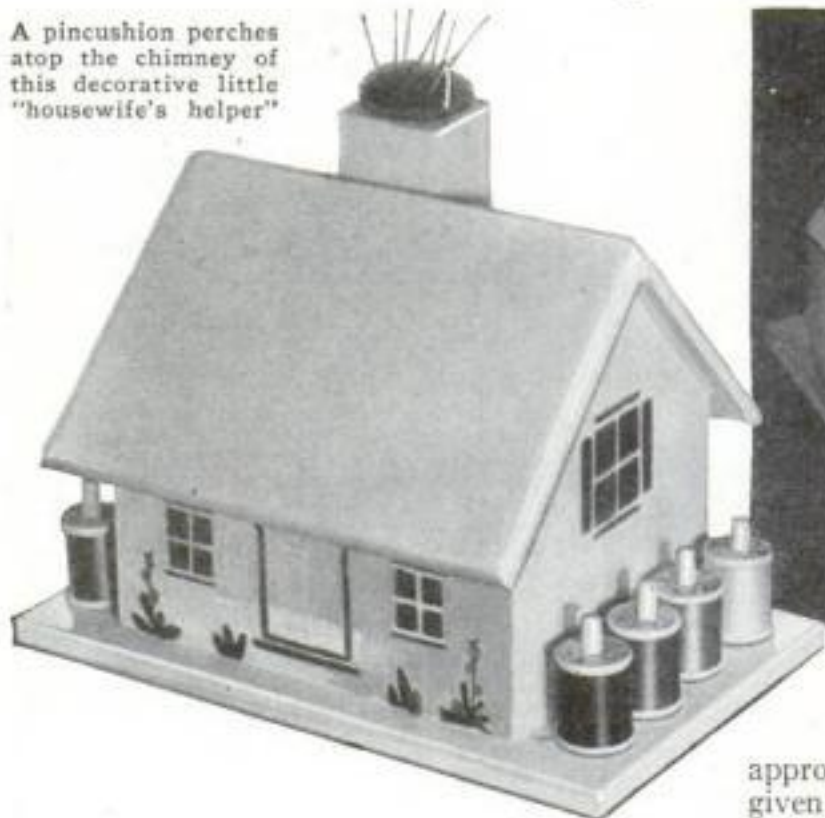
Bill of Materials

- 1 pc. 3/8" x 30" x 6' waterproof fir plywood for frames
- 1 pc. 3/16" x 30" x 6' waterproof fir plywood for reinforcing and floor
- 2 pc. 3/4" x 1" x 16' 6" spruce for inwales
- 2 pc. 3/4" x 1" x 16' 6" spruce for outwales
- 8 pc. 3/4" x 3/8" x 16' 6" spruce for longerons
- 1 pc. 3/4" x 12" x 3' oak for stems
- 1 pc. 1/2" x 1" x 15' oak for keel
- 1 pc. 3/4" x 1 1/4" x 15' oak for shoe
- 14 ft. 1/2" quarter-round oak for beading
- 1 pc. 1/2" x 2" x 6' maple for mast step, center thwart
- 2 pc. 3/4" x 2" x 8' maple for side coamings
- 1 pc. 3/4" x 2" x 32" maple for rear coaming
- 1 pc. 1/2" x 4" x 3' ash for mast step
- 3 ft. 3/8" birch dowering
- 1 gr. 1 1/4" No. 6 flathead brass screws for fastening longerons
- 4 dz. 2" No. 6 flathead brass screws for fastening frames to keel and inwale to frames
- 3 dz. 1 1/2" No. 6 flathead brass screws for fastening outwale to inwale
- 1 dz. 1" No. 5 flathead brass screws for fastening outwale to inwale
- 2 dz. 1/2" No. 5 flathead brass screws for fastening king planks
- 1/2 lb. copper nails for fastening frames
- 3/4 lb. 1/4" copper tacks for the covering
- 3/4 lb. 5/16" copper tacks for the covering
- 4 brass machine bolts 1 1/4" x 3/8" for stem heads
- Sheet brass for stem heads
- 11 yds. 10-oz. canvas, 30" wide for covering hull and deck
- 1 qt. spar varnish
- 1 qt. enamel
- 2 gal. airplane dope
- 1 lb. dry powder casein glue
- 1 pc. 2" x 2" x 14' 6" spruce, straight grain, for double-blade paddle
- 1 pc. 1 1/2" x 1 1/2" x 6' spruce for mast
- 2 pc. 1" x 1" x 6' spruce for gaff and boom
- 4 yd. airplane cloth or good unbleached cotton for sail
- 1 pc. 1/2" x 2" x 3' maple for leeboard thwart
- 1 pc. 3/4" x 10" x 3' 6" spruce for leeboard
- 2 pc. 3/16" x 3/4" x 3 1/2" brass leeboard braces
- 4 brass machine screws 3/4" x 1/2"
- 1 brass bolt 2" x 3/4" with wing nut and washer for pivot pin
- 2 brass bolts 4" x 1/4" with wing nut and washer for clamps
- Leather or rawhide for mast collar
- 8 yd. 8-oz. canvas for tent
- 1 gr. No. 0 brass grommets
- 1 ball chalk line and 1 hank braided 1/4" line
- 1 Army mosquito bar such as used on a single bed, 3 yd. 6-oz. canvas for cockpit cover, and 2 yd. 6-oz. canvas 36" width for jacket



Miniature Cape Cod Cottage Holds Sewing Outfit

A pincushion perches atop the chimney of this decorative little "housewife's helper"



Half of the roof is nailed in place; the other part is hinged to it to form a lid

A NOVEL little container for sewing and mending materials can be made in the form of a Cape Cod cottage from a few scraps of $\frac{3}{8}$ in. thick pine. Cut the pieces

approximately to the dimensions given in the sketch at the right and assemble with glue and countersunk brads. Fill the nail holes with composition wood or other suitable filler. One side of the roof, it will be noted, is nailed on solidly, and the other is hinged to it. The

joint should be squarely cut and smoothed with a sharp plane, and the finished cottage should be well sandpapered. The dowel pins which hold the spools should be of hard wood to avoid breakage.

Paint the house white with doors and other trimmings of what is often referred to as "Cape Cod blue." The flowers have light green leaves and red blossoms to resemble hollyhocks. A small pincushion is then fastened as shown on top of the chimney.—E. E. A.

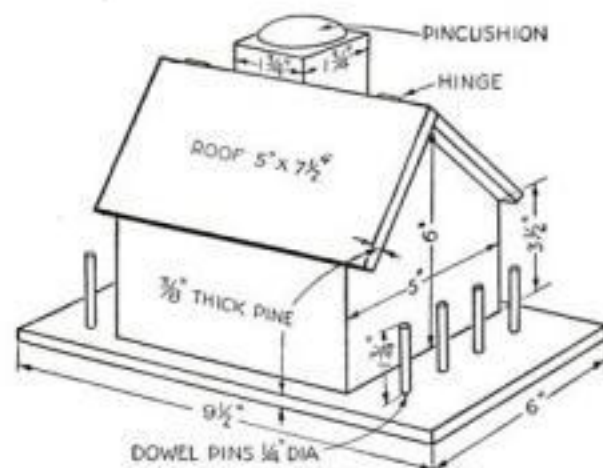
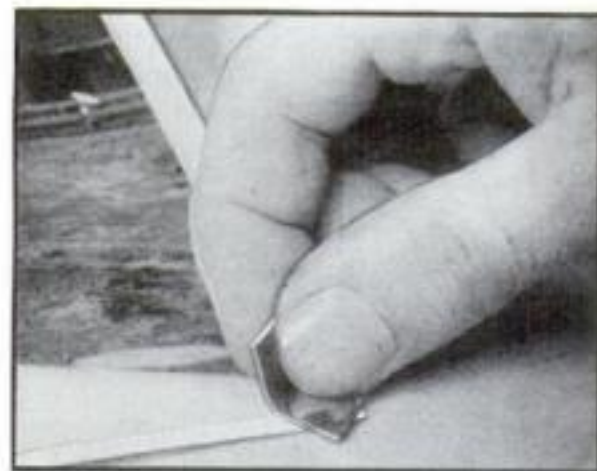


Diagram giving the dimensions used in constructing the outfit shown in the two photos

CHILD'S BICYCLE MADE FROM TRICYCLE

WHEN a child gets tired of his tricycle and wants to learn to ride a bicycle, it is not difficult to change the three-wheeler into a two-wheeler. This saves the expense of buying a small size bicycle, which is nearly as expensive as a large one and is almost certain to be outgrown long before it is worn out.

My boy's tricycle, which was several years old, had seen such hard usage that it was becoming difficult to keep it in repair as a three-wheeler, and one rear wheel was practically useless, so I took it apart and straightened out and closed up the rear fork to leave room for only a single wheel. This was done with the aid of a small charcoal fire which I made in the yard and blew into a hot flame with a tire pump. One end of the axle was then sawed off the right length and a hole drilled close to the cut end to receive a cotter pin. The better rear wheel was mounted on the axle, and the little bicycle was ready for use. My boy very quickly learned to ride it.—FRANK FISCHER.



THUMB TACK PERSUADER

THUMB tacks are often quite stubborn to remove without a regular lifter, especially when they have been pressed into fairly hard wood. This difficulty can be prevented, however, by first pushing the tack through a rectangle of leather measuring about $\frac{1}{4}$ by $\frac{3}{4}$ in. Insert the tack near one end so that half an inch of leather protrudes to form a convenient handle for pulling it out.—ROY ELTON.

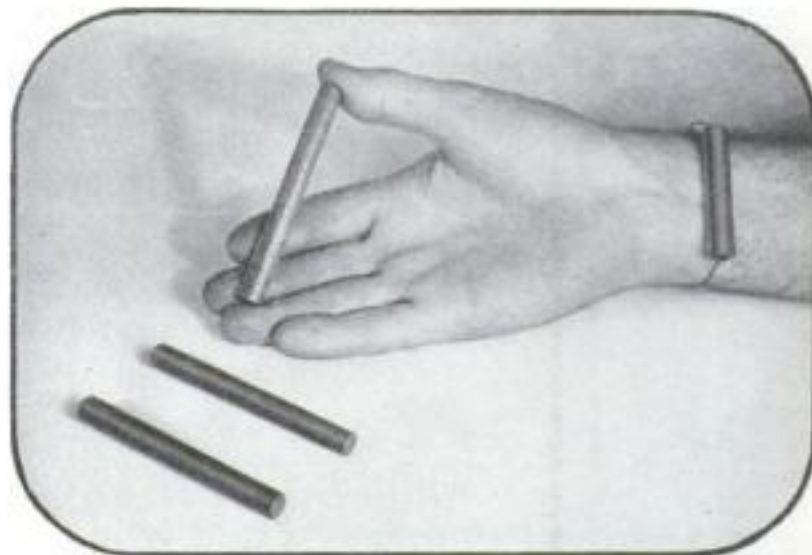
MAGIC STICKS RATTLE AT WILL

"MORE fun than you can shake a stick at" aptly describes the magic sticks shown at the right. There are three—two solid and one that rattles when shaken. Asking a spectator to keep his eye on the rattle-stick, the performer slowly moves them into different positions on a table. No matter which one the spectator picks up, he invariably chooses one that is solid.

There are four sticks altogether, each made of a 3-in. piece of wooden dowel rod, stained and varnished. Three are plain, but the fourth is bored out, a lead slug inserted, and the end plugged with a plastic wood composition. Still another somewhat shorter rattle-stick is prepared, and this is tied to the performer's arm

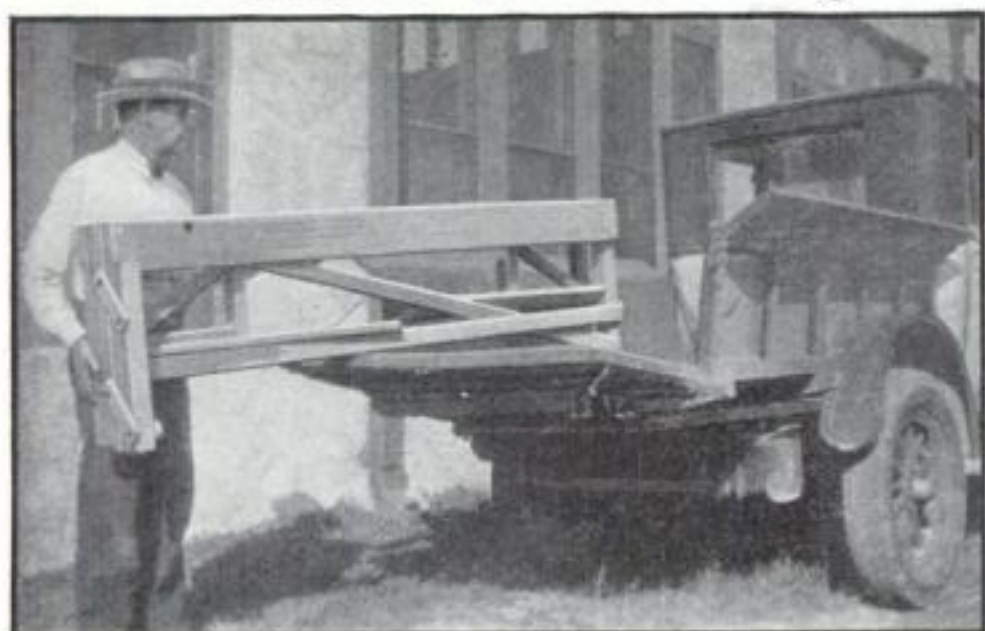
high enough up to remain concealed by his sleeve.

The spectators are allowed to examine two solid sticks and the full-length rattling-stick; then the magician secretly exchanges the latter for the third solid one in his pocket. Since all the sticks on the table are solid, none that a spectator picks out will rattle; but when the performer takes one in his hand and shakes it, the concealed short stick on his arm rattles.—K.M.



The performer apparently can rattle all three solid sticks because of a short rattle tied to his arm under his sleeve

Portable Woodworking Bench Saves Carpenter's Time

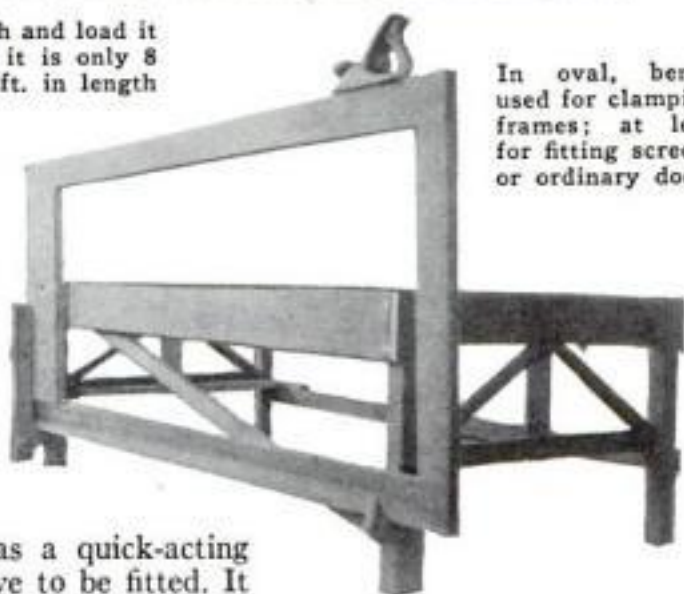


One man can carry the bench and load it on the truck. When folded it is only 8 in. wide, 2 ft. high, and 6 ft. in length

THIS portable wood-working bench, especially designed for use in new buildings and for jobbing work, takes the place of a pair of sawhorses, holds cabinetmaker's bar clamps stationary across the top for gluing up screen frames, doors and other flat work, and also serves as a quick-acting vise for doors which have to be fitted. It is 2 by 3 by 6 ft. when open, but only 8 in. by 2 ft. by 6 ft. when folded.

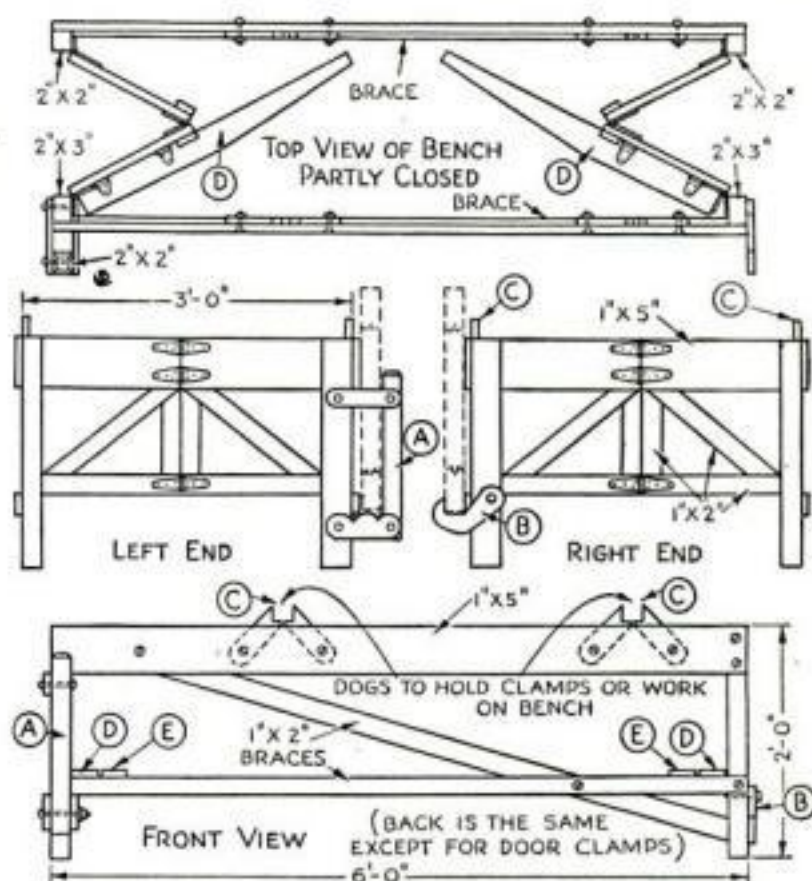
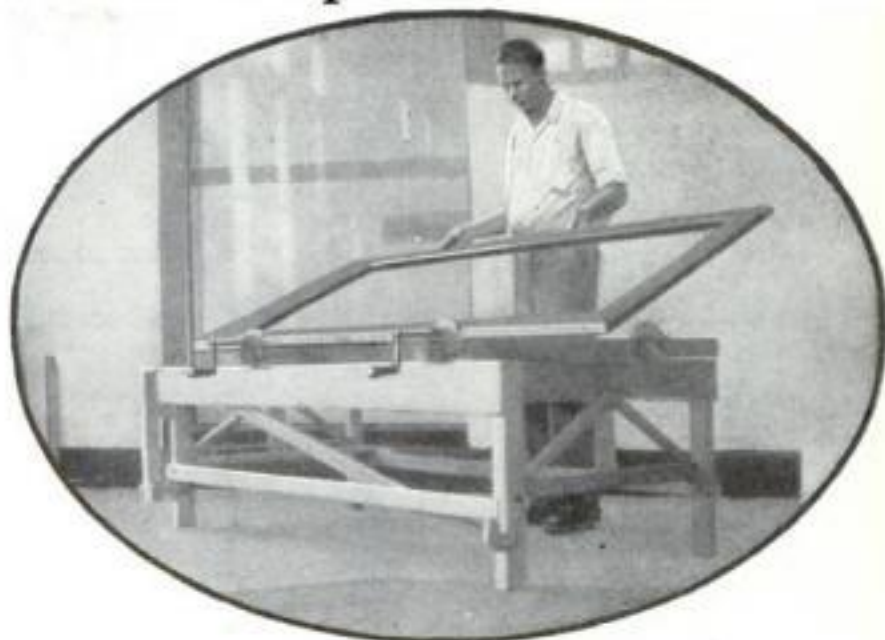
A study of the accompanying photographs and drawings will make clear the construction. In the drawings, *A* is the clamp that holds a door or other work vertically against the bench, *B* is a hook support on which the rear end of the work is supported, and *C C* are folding dogs—two pair on the front and two on the back—which hold clamps or cross supports when work is being done on the top of the bench.

The two end views show how the ends



In oval, bench used for clamping frames; at left, for fitting screens or ordinary doors

of the bench are hinged in the center. They are also hinged where they join the legs, as indicated in the top view of the partly closed bench. Parts *A* and *B* are arranged so that they will hold any work up to 2 in. thick. The hinged locking pieces *D* in the top view drop back of blocks *E* on the rear lower rail when the bench is open, thus holding the ends



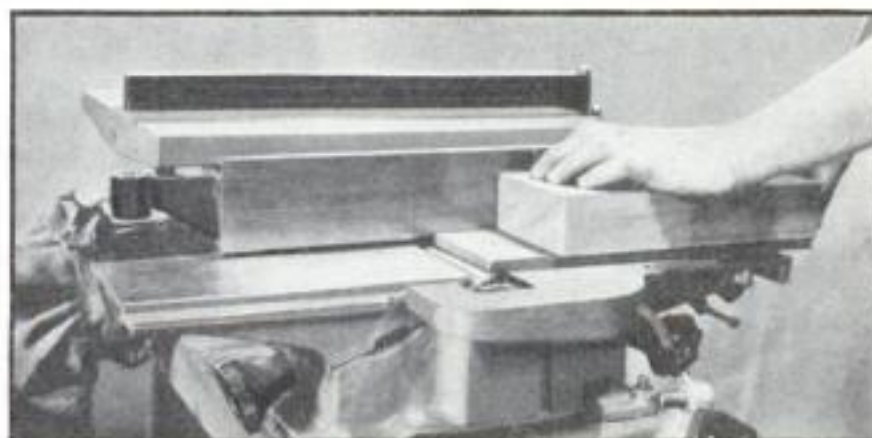
How the bench is constructed and a top view which shows it partly closed in order to make clear the method of folding

rigidly in place. The opened bench is solid and substantial.—W. P. FURMAN.

PLANING EXTRA THIN PIECES OF WOOD ON A JOINTER

VERY thin pieces of wood such as are often required in model making can be dressed easily and safely on a small motor driven jointer with the aid of a heavy hold-down block like that shown in the accompanying photograph and the sketch which appears at the bottom of the right-hand column. Until this hold-down was made, great difficulty had been experienced in surfacing properly on both sides some small panels $\frac{1}{8}$ by 3 by 6 in. It was impossible to keep them from chattering under the cut when passing them over the jointer with the ordinary type of notched stick used in handling small work.

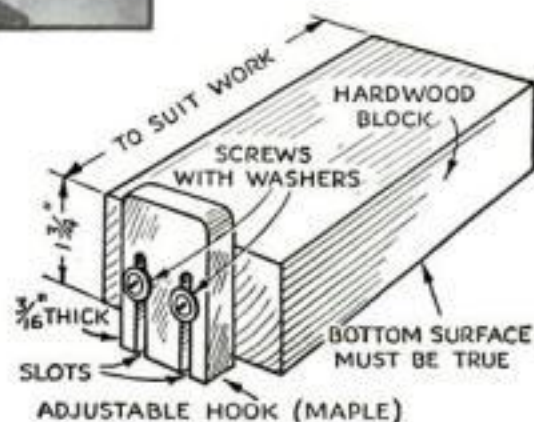
The heavy block, which is merely a variation of the notched stick, weighs so much more than the piece being surfaced and has such a true bottom surface that it prevents chattering. An adjustable hook is provided on the rear end to push the work through the cut. As a test of its efficiency a piece of maple $2\frac{1}{2}$ by 3 in. was planed down with its aid to a thickness of $\frac{1}{32}$ in.—D. A. P.



Using an extra heavy wooden hold-down to aid in dressing thin stock on a jointer. The hold-down, which is made as shown below, prevents chattering much better than the ordinary type of "hook"

Wanted . . .

Good, short home workshop articles, preferably illustrated with photographs which show what is being done, like those on this page. Send a large stamped and self-addressed envelope for Contributor's Bulletin.



• Removing Wall Paper



Live steam softens wall paper beneath the funnel so that it can be scraped off easily

WITH the homemade device illustrated above, I can remove four layers of wall paper from an ordinary size room in one day. The idea is to play live steam on the paper by holding a funnel tightly against the wall, while the other hand is busy tearing off the thoroughly soaked paper with a putty knife. As soon as one patch is torn off, another is ready.

The equipment can be moved from room to room since it is attached to a kitchen gas range by means of 50 ft. of rubber tubing.

An old two-burner gas plate placed on a piece of sheet iron serves as the heating apparatus. Flexible metallic tubing connects the rubber tubing with the gas plate. I had to enlarge the nozzle on the gas plate 1/16 in. by drilling in order to give a greater volume of gas.

The heating tank is a 5-gal. oil can wrapped with asbestos sheeting on the top and sides and bound with copper wire. I soldered an inverted funnel to the top of the can and to this fastened a 10-ft. length of garden hose. Into the end of the hose I set the end of an 8-in. funnel. Because of the heat and in order to insure a firm grip, a 3-ft. length of broomstick must be fastened to the end of the hose by means of tape, wire, or rope. As a further protection, I always wear a thick glove on my left hand.

The water is brought to a boil on the kitchen range before being poured into the can, which is never kept more than half full. The softened paper is removed

with a putty knife 3 in. wide and beveled on one edge. It is necessary to wash a wall from which the paper has been scraped in order to remove all traces of paste and size.

Rubber tubing at 2½ cents a foot, amounting to \$1.25, two funnels at 10 cents each, 10 cents for asbestos, or \$1.55 all told was my outlay for this equipment, the other parts being on hand. Professional paper removers who bring their own machines charge \$2 an hour in my neighborhood. The only other home method I have ever seen in operation is the tedious soaking of the walls by hand, which often means five or six days' work for each room. Frequently, too, the plaster is badly nicked, whereas with my device the walls are left absolutely smooth and ready for repapering.—HENRY CASPAR BLOM.

Shipshape Home SUGGESTIONS for September

- Repair roof, gutters, and downspouts
- Do any necessary excavation and concrete work
- Waterproof the cellar
- Apply weather stripping to windows and doors
- Refinish floors and woodwork
- Fix up an extra attic or basement room with insulating board, fiber board, plaster board, or in any way that will make it snug and usable for the winter
- Repair or enlarge coal bin

How to Damp-Proof Basement Walls

AN INEXPENSIVE and colorless solution for damp-proofing basement walls can be made by dissolving paraffin in gasoline or kerosene. Warm the gasoline or kerosene to about 80 deg. and add the paraffin in small quantities, 1½ lb. of the wax being used for every gallon of the solvent. Extreme care should be taken in mixing and applying the solution to see that there is a good circulation of air and no open flames to ignite the fumes. China wood oil is also highly recommended for this purpose.

Stubborn cases of damp cellar walls can often be remedied by the application of two coats of hot asphalt or coal tar to the outside surface. Of course, it is necessary to dig a ditch around the foundation for the entire depth of the wall. Brush coatings of the bituminous type also can be obtained for this purpose; these are applied cold.

In laying new waterproof concrete structures, a better concrete can be made by adding hydrated lime in the proportions of 1 part to every 10 parts of cement. The lime forms a denser mixture.—J.S.



A strip of galvanized wire mesh is fastened over gutter to keep leaves from clogging it

Long Strainer Covers Entire Gutter

COSTLY damages to walls and wall paper caused by overflowing eaves gutters and downspouts can be prevented, in most cases, by a periodic cleaning of these drains. Not only do leaves, twigs, and paper clog the gutter, but the rotting action of such refuse forms an acid which is injurious to metal, causing the drains to rust prematurely if they are of ordinary galvanized iron, as is so often the case. Cinders are particularly corrosive.

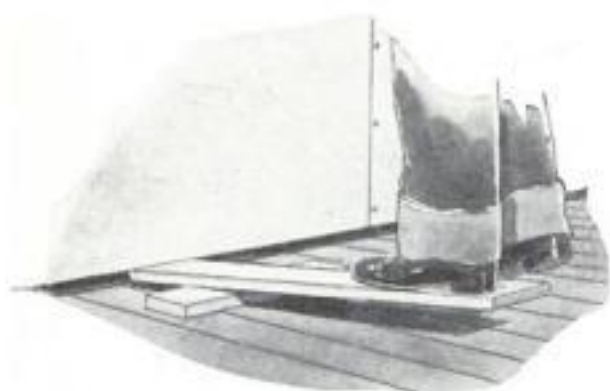
A practical and easily applied method which will prevent eaves gutters from clogging is illustrated above. Strips of ¼ or ½ in. galvanized wire mesh, or "hardware cloth" as it is frequently called, are placed along the upper part of the trough, flush with the top edges, and fastened with wire twisted around the gutter supports. Leaves and other trash are caught by the screen and in time dry up and are blown away.—H.J.M.



The best way to damp-proof basement walls is from the outside after digging a trench

with Steam

..... AND FIVE OTHER
SHIPSHAPE HOME KINKS



Using two scrap pieces of wood to keep wall board raised in place while nails are driven

Foot Lever Helps Apply Wall Board Unaided

EARLY in the fall is perhaps the best and most convenient time of the year to convert a part of your basement or attic into a comfortable room by applying wall board. Manufacturers of wall board distribute a variety of excellent booklets, instruction sheets, and diagrams of properly arranged wall panels, and these give all the information any handy man requires.

The work of setting the wall panels in place and forcing them up flush with the ceiling boards can be made a one-man job by using the simple lever arrangement shown above. A piece of wood about 20 in. long forms the lifting lever, and a hammer or small wood block acts as the fulcrum or pivot point. Pressure of one foot on the lever easily raises the wall panel into place, leaving the hands free for driving the nails or setting the patented wall board fasteners (see P.S.M., Dec. '30, p. 127) sometimes used.—M.C.P.



Washing painted walls, whether outside or inside, has always been a disagreeable task, but a new variety of cleanser takes the drudgery out of the work, yet does not harm the paint. At left: Rinsing a house by using a garden hose tied to a pole

How to Mix and Spray on Creosote Shingle Stains

FOR brown or black shingle stain, ordinary commercial creosote oil is equal to many prepared shingle stains at several times the price. Colored stains, such as red or green, can be prepared by tinting the clear creosote oil with colors ground in oil. This clear creosote is higher in price than the dark oil, but is still much cheaper than prepared stains, the price of which is largely dependent upon the quantity and quality of the creosote oil they contain. About 3 lb. of colors in oil are required for 5 gal. of oil. The creosote oil is obtainable at any wholesale druggist or large dealer in painters' supplies.

Home owners who have garden spraying equipment, especially if of the compressor type, can use it for softening wall paper that is to be removed and for whitewashing, and also for applying shingle stain. The last mentioned job is always a bad one for the amateur because of the action of the creosote on the skin, which can hardly be avoided with brush work. The principle is the same as spray painting, and it is essential to strain the stain thoroughly so that there will be no sediment in the tank to clog the nozzle.

When using my spraying equipment in this way, I attached two extension rods, each 3 ft. long, to the hose. These kept the spray and fumes away from my face and also allowed the nozzle to be held close to the work so that no spray was lost. A whole bungalow roof was completed in two hours. Two trips only were made up and down the ladder during the job.



If garden spraying equipment is available, it will save time in staining a roof

Rubber soled shoes should be worn on roof work as they grip better; and in spraying the operator should work toward the ladder, so that he will have no occasion to walk on the stain while wet, for it is extremely slippery. As the tank is heavy when full, it is best to pass a double line around the highest chimney for a life line, and this can be withdrawn from the ladder when the spraying is complete. Accidents should be carefully guarded against.—H. CALDWELL.

IN AN emergency, mahogany furniture can be touched up successfully with tincture of iodine.—DOUGLAS LEECHMAN.

New Washing Method Makes House Look Repainted

BETWEEN regular periodic paintings, you can improve the appearance of your house greatly by giving it a bath. Prepared vegetable compound cleaners that will not hurt your hands nor scratch the paint make it possible to clean a whole house in a remarkably short time without having to scrub it laboriously.

One new type of cleaner, now obtainable from most of the larger hardware and paint stores in powder form, is mixed with cold water and applied to the painted surfaces with a flat paintbrush. Sponging it off then removes all the grime and surface dirt. Even rust spots vanish when this cleaner is used. A good comparison of before and after is shown in the photograph in the circle at the left, where a part of one washed board can be seen directly above the brush.

After you have applied the cleaner and sponged down the walls, you can give the house a thorough rinsing by tying the hose to a 10- or 12-ft. pole as suggested by Ralph H. Sprungman, of Minneapolis, Minn., in the other photograph at the left. You will be able to direct the stream of

water at any portion of the walls without getting wet, and the stream will hit the walls at right angles, thus preventing any of the water from being forced up under the siding.—G.W.

Dollars for IDEAS

IN KEEPING your home shipshape, you no doubt hit upon various ingenious time-saving and labor-saving ideas. You will find it profitable to send a brief description and photographs or sketches of any work of this type you do to the Home Workshop Department. Payment is made on acceptance for available material. If you are interested, send a large self-addressed and stamped envelope to the Home Workshop Editor, POPULAR SCIENCE MONTHLY, 381 Fourth Ave., New York City, for Manuscript Bulletin No. 9.

Capt. E. Armitage McCann explains the fine points of

Making Fore-and-Aft SAILS

FOR ANY SHIP MODEL

ON THE earlier and more picturesque types of ship models, it is an added advantage to set some or all of the sails. In fact, many model makers wish to have sails even on their scale models of latter-day vessels. For this reason we gave suggestions last month (P.S.M., Aug. '32, p. 72) on the making of square sails, and in the present article will describe the fore-and-aft sails.

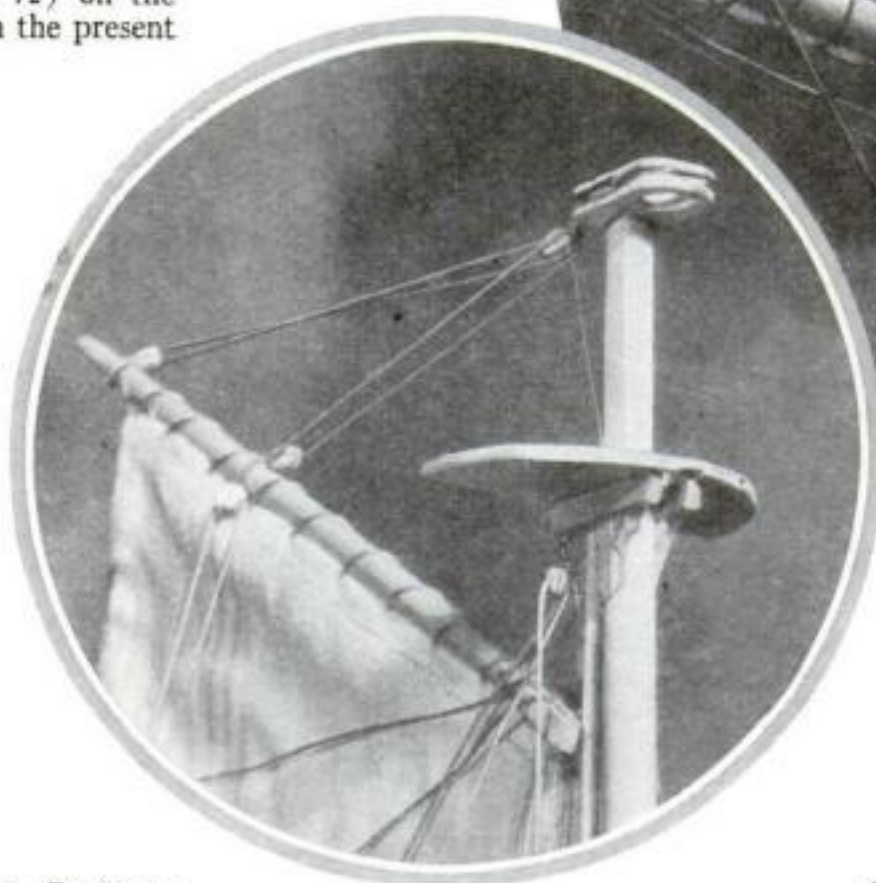
Model sail making, it must be understood, is not real sail making. There is neither space nor necessity for describing every little detail, but sufficient information is given to allow neat and accurate sails to be made to any desired scale up to at least $\frac{1}{4}$ in. equals 1 ft. How many of these details are used and how much is omitted on the smaller scales is for the individual to decide. In bending sails for a period earlier than about 1840, the correct shapes and gear for the required period must, of course, be used.

For the benefit of those who did not see the last issue, everything described there is graphically shown on POPULAR SCIENCE MONTHLY Blueprint No. 185. In the same way Blueprint No. 186 applies to this article. You should send 50 cents to the Blueprint Service Department for both of these, using the coupon on page 80. The sails shown on the blueprints fit the model of the whaling bark *Wanderer*, recently described in this magazine (see page 87), but can be adapted to any square-rigged vessel.

In the upper right-hand corner of the drawings on page 65 and on Blueprint No. 186 is shown a picture of about all the fore-and-aft sails a full-rigged ship ever carried, amounting to seventeen. Under all plain sail they did not, however, often set more than the following: fore-topmast-staysail; inner, outer, and flying jibs; main lower, topmast, and topgallant staysails; mizzen lower, topmast, and topgallant staysails; spanker, and possibly a ringtail. Studding sails, which are too complicated to describe here, are extraneous to the regular rig and quite unnecessary on a model.

It is impossible to write about sails without using many nautical terms for

Real sails and rigging, seen close up, look to be enormous, but in a model they must be delicately made as in the photo below, which is the gaff and upper part of a ship's spanker



which there are no substitutes. However, most of them are easily understood from the accompanying drawing, and the definitions of any others can be found in all unabridged dictionaries.

The material and general method of making fore-and-aft sails are the same as for the square sails. To measure a headsail, the height on the stay will be about from the middle of the topmast to about 2 ft. from the jib boom. The angle of the foot is governed by the steeve (rise of the bowsprit) and also depends to some extent upon where the sheets are to be belayed. The flatter the stay, the longer the foot, so that the sheet will bring a fair strain from clew to stay.

The stitching to represent seams should be parallel to the after leeches on all these sails. The fore leech is best if made with a selvage edge, but it can be hemmed like the others. The clews may have round thimbles stuck in them, but I suggest using thimbles in the sheet clews only. The others can be bights in the bolt ropes, which are sewn on the port side.



Eyelets, if you can find some small enough, serve well for thimbles. I make mine by filing a deep groove in a piece of brass tubing and then cutting off the thin section.

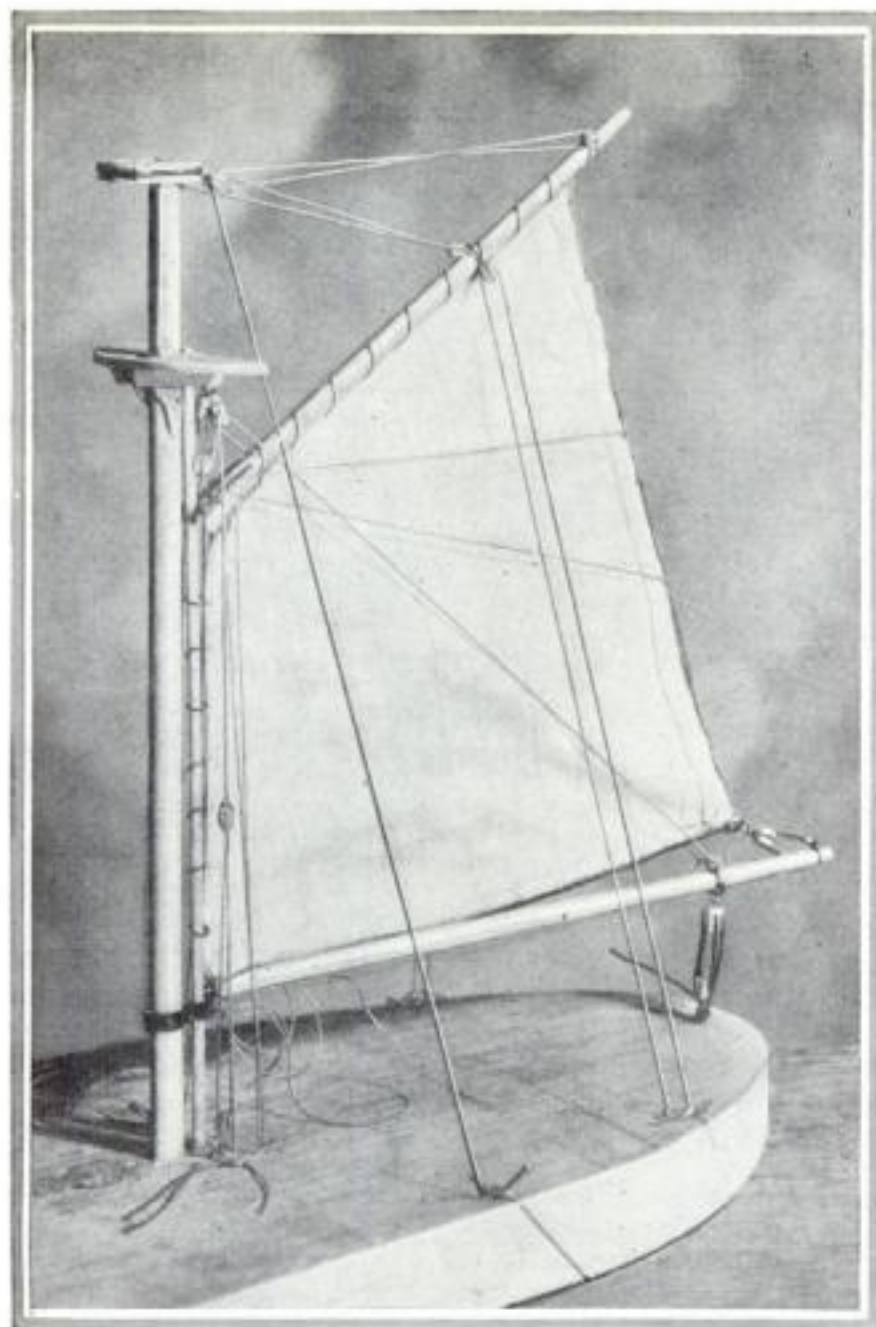
No reefs are necessary, though some old-timers had one or two in the spanker.

The staysails, between the masts, are made in the same way.

There are quite a number of different kinds of spankers. The one shown on the blueprint is for a fairly modern bark such as the *Wanderer*. The fore leech is seized to a jackstay on the mizzenmast. The head has hoops to the gaff and is hauled out with an outhauler over a sheave at the gaff end. The sheet is single rope or chain, and sets up with a gun-tackle purchase to the mast or a cleat on the boom. This sail has three brails clinched to the after leech by which it is furled to the mast.

The spanker shown in the photographs is the more usual one for the fast clippers. The boom is fixed in position with a gooseneck; the gaff is hauled up with throat and peak halyards. The forward leech is seized to hoops which travel on a thin trysail mast abaft the mizzenmast. The head is laced to the gaff. The sheet hauls out as before described, or with a block at the clew. The brails lead to sheaves in the jaws of the gaff, to snug the sail up when it is not desired to lower the gaff.

The gaff-topsail is a sail for barks, barkentines, hermaphrodite brigs, schooners, or other rigs where the mast is fore-and-aft only. It hoists with hoops on the



A carefully detailed model of a spanker made by Captain McCann to illustrate points in the text and mounted temporarily for display on a wooden block

eyeband. The tack is loose and has to be dipped over the span or peak halyards when the ship goes about, so that it will be to leeward of them but to windward of the gaff. The down-haul is variously rove, usually going straight up to the peak, through a block or thimble, to the clew, and clinching at the tack clew.

The jibs and staysails on a ship are seized to hanks on the stays at intervals of about 30 in. A detail of the real hank is shown, but for a model rings will serve us better (to be rove on the stays before they are finally fixed). For large scale models, suitable rings can be found at fishing tackle stores, but for small work cut up a piece of chain, rounding the links by forcing them onto a crochet needle or brad-

awl. You can also make them from wire. A short tack or lashing is needed to keep these sails from running up the stay. The halyards are usually a single block

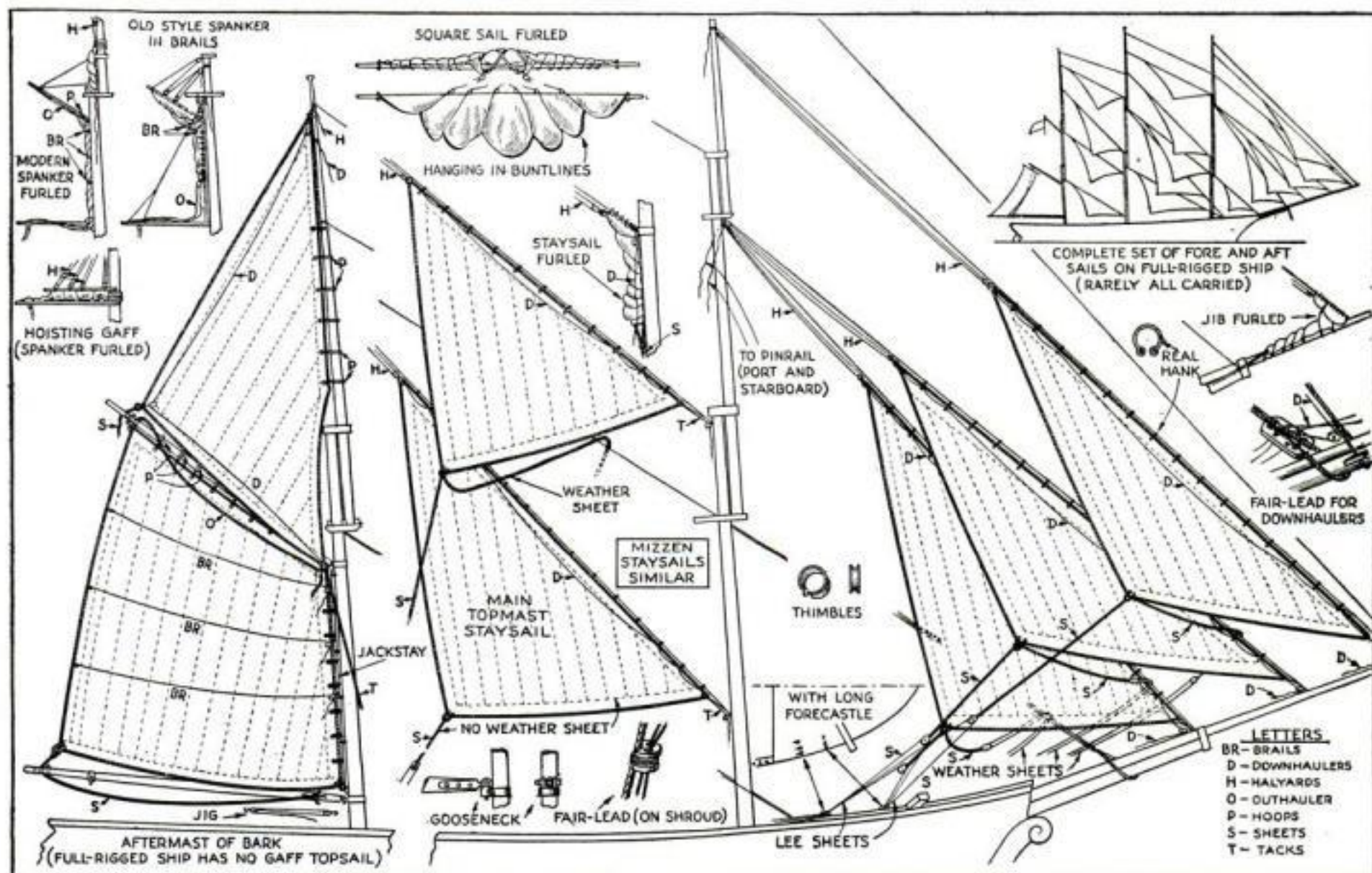
at the peak and another at the masthead. The fore-topmast-staysail block is to port, and the others alternate.

The headsail sheets are double, with longer or shorter pendants, a heavy block, and a whip. The lee sheet is hauled tight and the weather one hangs slack over the stay, but the end is not entirely let go. One end of the whip hooks to a bolt in the deck; the other comes through a fair-lead in the deck and to a belaying pin.

With a long forecastle deck, as with most clippers, these deck bolts were on the forecastle as shown in the detail, and the ends were lead either to the main deck pinrail or to cleats on the forecastle. With a short forecastle, as on the *Wanderer*, both ends come direct to the deck.

The main staysail sheets were usually single and were belayed under the rigging. I prefer the sails hanging limp as in a calm, but they can be bellied out stiff as if filled with wind. After a lot of experimenting I have found an excellent way to attain this so that they will remain as originally set. Carve a piece of wood to the shape of the largest sail with just a little more belly than is required. Put a piece of waxed paper on this and stretch the sail over it, pinning it down straight along the head but dragging it a bit to the sheet clews. Then, if you wish it to be white, rub in one heavy coat of white lacquer paint and leave until dry; if you want an unbleached tone, use clear lacquer. Round the wood a little more for the next sized sail, and so on. It will help these sails to keep their belly if you run a thin stiff wire up the leeches before painting. Let the ends of the wire at the top project a little, and bend the points down and stick them through the yards. Seize to the jackstays and sheet home.

A model will look well with some of



Typical fore-and-aft sails of every type a model maker will be likely to use are given above and, on a much larger scale, on Blueprint No. 186

the sails set and some furled, for example, as the ship might appear on getting under way—with topsails set, courses hanging in the buntlines, perhaps one topgallant sail the same way, and the other sails completely furled.

If you are going to furl the sails, make them of the very thinnest possible material, otherwise they will not stow neatly. On the blueprint are details showing how the various sails look when in the buntlines (clewed-up) and when furled. The square sails are picked up in front, most of the sail being near the middle; they are then dropped into a skin formed of the part nearest the yard, rolled right onto the yard, and lashed down with the gaskets. The middle (bunt) gaskets are a

THIS SPARKLING Garden Cascade

RUNS AT LOW COST FOR WATER

ANY flower garden can be made more attractive by providing a little pool in it, preferably with a pile of stones or rocks so arranged in the center of the pool that a small stream of water can cascade down them in a sparkling stream for perhaps 3 or 4 ft. before splashing musically into the pool itself. Such waterworks are easily made—in fact, far more easily than the average home owner is likely to believe.

It is true that if we use water from the city mains and let the cascade run day and night for eight or nine months a year, it will add a sizeable item to the water bill, but that is not at all necessary. Generally it is sufficient to operate it about twice a day for one or two hours each time; that is amply long enough to amuse the children, attract the birds, and help along the plant life. These hours can be the ones we ourselves spend in the garden, working or reading.

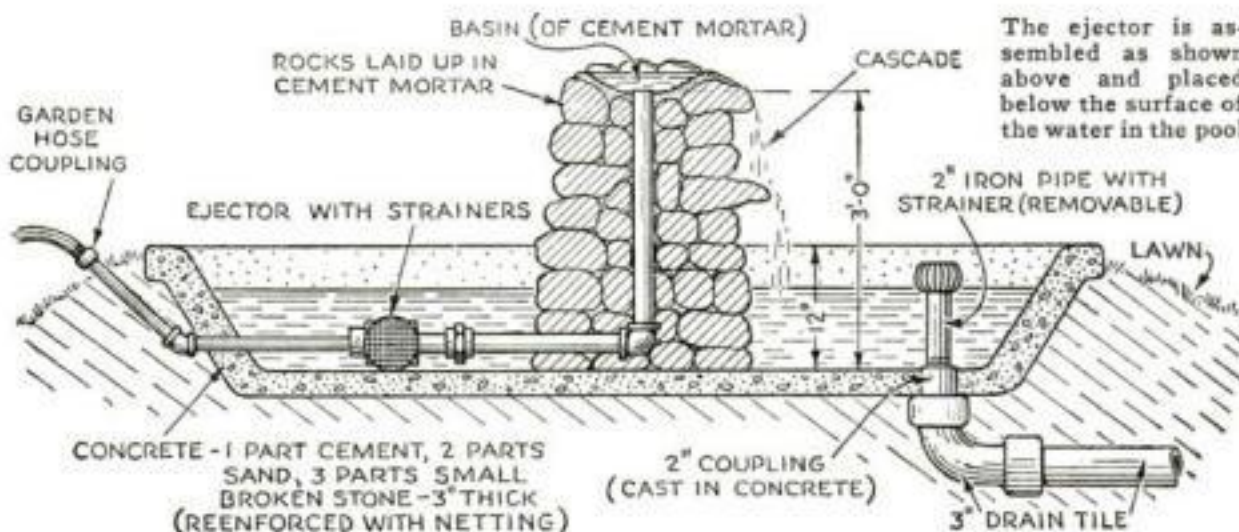
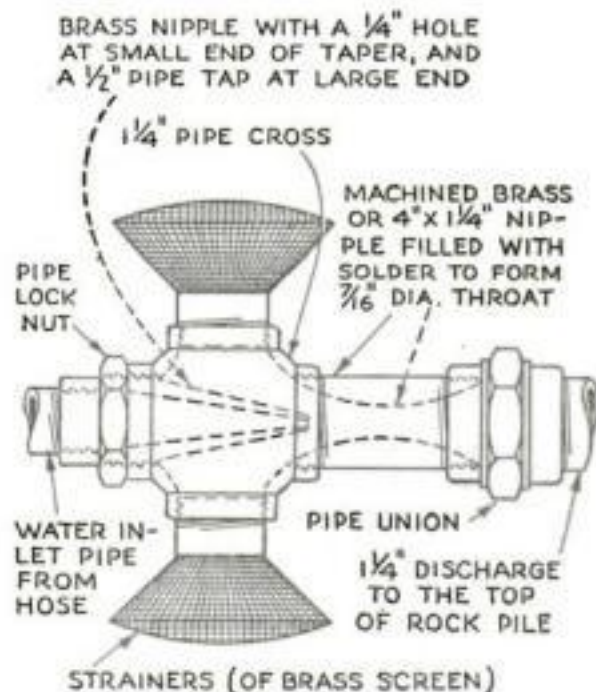
Even when the period of operation is restricted to this extent, a considerable saving in water can be effected by making a water ejector as shown in the accompanying drawings. From 3 to 7 gal. of water from the pool can be raised and discharged into the basin on top of the rocks for each gallon of city water used at 40 lb. pressure per square inch. The ejector, of course, must be set in the water on the bottom of the pool so that the two strainers are always under water.

The device can be made mainly from pipe and fittings. The piping may either be built into the pile of rocks with a small concrete basin at the top from which the water can overflow and cascade down as suggested in the cross sectional view at the bottom of the page, or it can be led over the top to discharge into the basin, in which case the entire arrangement of piping, including the ejector, can be removed easily at any time. With either method the water may be brought to the ejector by means of the garden hose, which is coupled to the piping in a convenient place near the rim of the pool. It is desirable, however, to arrange the waterworks



This type of bird basin is inexpensive and can easily be provided with flowing water

so as to use only a short hose. Have the pool as near the source of city water supply as possible so that the pressure will be reduced as little as possible by pipe friction.—FREDERICK SALMON.



A cross section of the pool, bird basin, and cascade. The overflow pipe is greased at bottom and screwed in by hand so that it can be removed when necessary to drain pool

kind of simple net made of plaited cord, with a tail which fastens to the tie; this hangs under the sail when set. The yard-arm gaskets are small lines hitched to the jackstays. When not in use, they are "made up" and hang on the fore side of the sails.

The jibs are furled to the jib boom, the staysails to the masts or vertical parts of the stays, and the spanker to the jackstay (or when the gaff lowers, to the gaff). Any yachtsman can show you how to furl a sail neatly.

A schooner's sails, with due allowance for the difference in shape, will be much the same as those described here, although always with a hoisting paff. There are no brails, but possibly lazy jacks instead.

Coming next month—An article on building a speedy $\frac{1}{8}$ in. scale model of our motor boat Vagabond, driven by rubber bands or a toy outboard motor.

—THE EDITOR.

TOY SAILBOAT LANDED WITH ROD AND REEL

ANY boy can have a lot of fun with a toy sailboat by using a fishing rod and line to control it. The end of the line is tied to the boat, which is allowed to sail away as far as it can go. Then the boat is reeled in as if it were a big fish. This requires considerable skill.—FRED CORNELIUS.

LENS ON AQUARIUM MAGNIFIES FISH

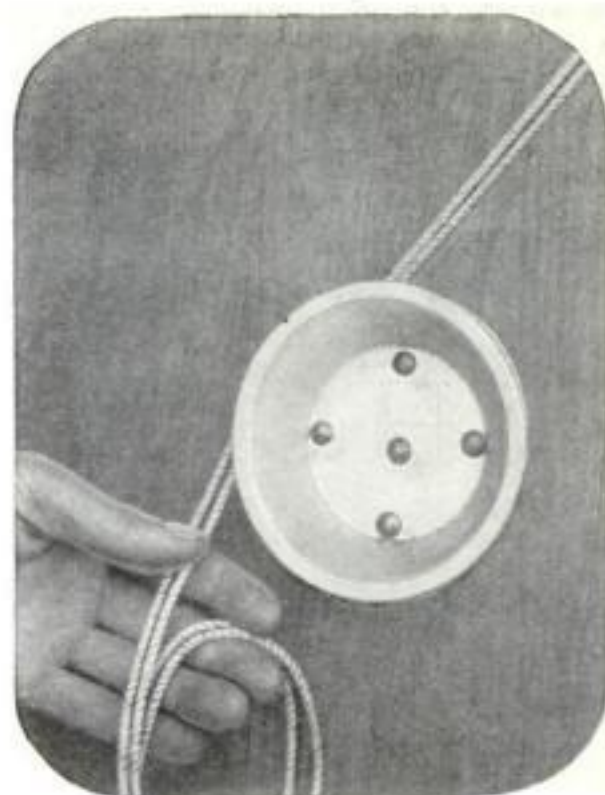


A large condensing lens cemented to an aquarium gives a magnified view of the fish when they swim within its range

A MAGNIFYING glass attached to the outside surface of your aquarium will make it easier and more interesting to inspect the fish, particularly if they are of the miniature tropical variety. Obtain a plano-

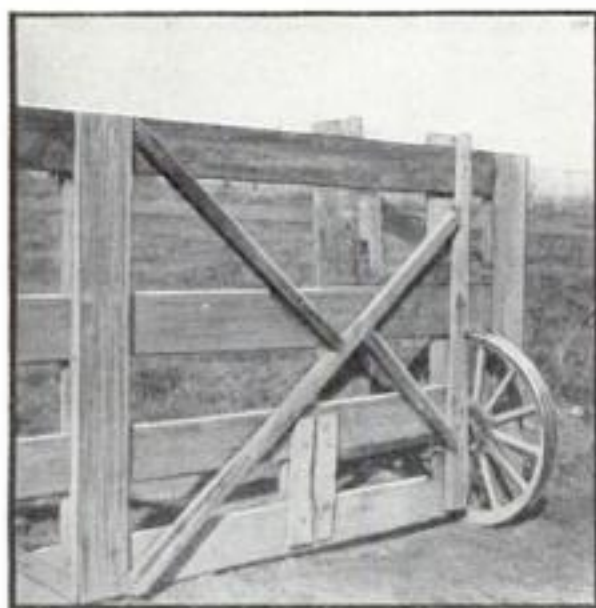
convex lens; that is, one having a flat surface on one side and a curved surface on the other. The diameter may be anywhere from 3 to 7 or 8 in. Such lenses are sold under the name of "condensing lenses" and are not very costly. If the glass in your aquarium has a perfectly flat surface, you can cement the lens to it by applying a little Canada balsam to the plane surface and pressing the lens against it. Try to exclude all air bubbles. Wash off any excess balsam with a rag moistened in turpentine, and arrange some support for the lens until the balsam hardens—a matter of a week or two.

If your aquarium has uneven sides or if you do not want to mount the lens permanently, you can arrange a stand or a sling that will support the lens in the desired position. You can determine how the lens will perform when mounted on the glass by wetting the flat side with water and pressing it against the aquarium. It will remain in place for a considerable time before the water evaporates and lets it fall, but be alert to catch it.—ERVIN WALTERS.



DEEP CAKE TIN SERVES AS CLEAT FOR CORD

IT FREQUENTLY happens that the ordinary small line cleat with two horns does not hold a sufficient quantity of light rope or heavy cord, especially in connection with large or very high curtains, drops, ventilators, and similar movable building attachments. In such cases a small deep pie pan or cake tin may be used for this purpose as shown above. When securely fastened with nails or screws, it will hold a lot of cord, which may be quickly wound or unwound from it, and it is also neat in appearance.—F. B.



The wheel mounted in this large farm gate allows it to be rolled back without effort

HEAVY GATE ROLLS OPEN ON OLD AUTO WHEEL

HEAVY gates are often difficult to open and close because they drag and catch as they scrape over the ground. This can be remedied by using the front wheel and the rear axle of an old Ford. Pass the axle through the wheel and fit them as shown above into an opening cut in the lower front corner of the gate. The opening should be just high enough to allow the wheel full play. Fasten strips on the gate in such a way as to hold the ends of the axle in place. When the gate is unlatched a mere touch will be enough to make it roll back out of the way as far as it can go.—E. S. WILLIAMS.

CAMP FOODS KEPT IN FOLDING COOLER

TO KEEP perishable foods from spoiling and to allow the camper many more delicacies other than the usual camp fare, it is not necessary to have ice. The folding "desert cooler" illustrated at the right will help solve the problem, yet it takes up very little room in the car—only 4 by 7½ by 11 in.

The articles needed can be bought in the ten-cent store: three cake tins 7½ by 11 in. and 1½ in. deep at 10 cents each; 3 yd. of brass wire link chain at 10 cents a yard; and 5 cents worth of split brass paper fasteners. A good grade of burlap coffee bag should also be obtained from a grocery store.

The pans are arranged as shown. The upper one is to contain the water, and the only holes in it are those that are used for fastening on the burlap cover. Four ⅛-in. holes are drilled in the bottom of both the middle and the lower pans near the corners to allow any water that collects to drip from one to the other. At equal distances near the top edge of all three, ⅛-in. holes are drilled where the burlap covering is to be pinned to the pans. Equal lengths of chain are used at the corners to space the pans about 5½ in. apart. A link in the chain is opened and hooked around the wire rim of the pans at each corner, and closed again.

Cut the burlap covering 17 by 40 in. and hem the two ends and one side. Hang up the assembled pans by the top chains and, beginning at one corner, pin the burlap on with the split paper fasteners. There should



The folding cooler with burlap turned back to show contents. The top pan holds water

be about 3½ in. of burlap at the top; this is folded over into the top pan. The water is drawn out of the top pan by capillary attraction and moistens the sides. The continual evaporation of the moisture keeps the contents colder than the outside air. The cooler works best in a dry atmosphere.—CLIFFORD P. BALDWIN.

Shut One Eye before you take a PHOTOGRAPH



*Then you will see just what your camera sees
and be able to improve your pictures greatly . . .
Other hints on lighting, backgrounds, and clouds*

By Frederick D. Ryder, Jr.

HAVE you ever closed one eye while you studied the subject you expected to photograph? Try it next time; it will help you to avoid uninteresting pictures.

Our two eyes give us a stereoscopic effect. Near-by objects stand out from the background. We can tell at a glance approximately how far from the wall a chair is standing. We see a world that has three dimensions—width, height, and depth or perspective. Your camera, on the other hand, has only one eye, the lens, and it sees things in only two dimensions, height and width. So far as the camera is concerned, it cannot distinguish between a group of objects in a room and a flat picture of the same room.

This difference in the way we see and the way our cameras see causes a lot of grief for the beginner at photography. He forgets that the camera lens takes the light from all objects within the field of view and reproduces them on a single plane. In taking a picture of a person, for example, the eye naturally centers on the subject's face. Other details in the background, because they are quite obviously several feet away from the main object, do not appear important.



When the negative is developed and printed, it frequently happens that some unimportant detail in the background spoils the picture. The upper photograph on this page shows what I mean. See how



Flat as an underdone pancake, the portrait above is an example of poor lighting and an unfortunately chosen background. At the left is the same subject properly posed and lighted

the sprig of lilac from the bowl of flowers in the background makes the subject look as though he had a goat's whiskers.

Aside from this accidental comedy effect, the picture is otherwise completely uninteresting. The face, because the light was placed directly in front of it, blends into the background and has, apparently, no more shape than an underdone pancake.

Now study the picture in the center of the page. Here is the same man, moved over a bit to get rid of the distracting lilacs, and turned around so that the light produced some shadows on his face. In all other respects, including exposure, stop, development, and printing, the two pictures are identical.

These two examples show what happens when you forget that the camera has only one eye. A careful one-eyed look at the subject from the point of view of the lens would have shown what the lilac



These two pictures illustrate in a striking way the importance of taking photos only when the light is favorable. The one at the left, made at noon, has no pleasing interplay of light and shade. That at the right was taken at 9 A.M., when the sunlight revealed every detail

sprig was likely to do to the picture. Keeping always in mind that a picture is nothing but a combination of lights and shadows will help you to avoid such flat and uninteresting lighting.

In portraiture and the photography of small objects, you can, in most cases, move the subject or the source of light till you are satisfied that you have a suitable arrangement.

Picturing scenery or buildings is another matter. You can't move the building till the lighting is right, and yet the lighting determines to a large extent whether the picture will appear interesting or not.

Undoubtedly you have seen and admired professionally taken photographs of public buildings and homes. Perhaps you may even have watched a photographer do such a job. What you did not see, however, was the preliminary visit he made to look over the ground. On important jobs, the photographer may make several trips to the location, leaving his apparatus at home, to determine at just what hour of the day and under just what kind of light the building appears to best advantage.

To illustrate how important lighting is, I took the two pictures appearing at the bottom of page 68. They are identical in every respect except that the right-hand one was taken at nine o'clock in the morning and the other was taken at noon. As the direction of the shadows in the nine o'clock view indicates, the house faces somewhat east of north.

See what a difference lighting makes in such a case. In the nine o'clock view, the bay window appears to stand out from the plane of the rest of the wall, whereas in the twelve o'clock view the bay window, because of the complete absence of shadows, seems nonexistent unless you

HOW TO TAKE *Arresting Pictures*

1. Study the subject with one eye closed and the open eye directly in front of the lens.
2. Remember that the background is an important part of the picture and see that no queer effects are likely to appear in the photograph.
3. Forget about pretty colors and judge the picture value of the subject in terms of light and dark areas.
4. Keep always in mind that the more you study the picture *before* you press the button, the better will be the result.
5. Whenever possible get a picturesque cloud formation into every distant view.

infer that it is there from the relative size of the windows. Compare, also, the appearance of the brickwork steps, the chimney, and other details. The general effect of the twelve o'clock lighting is flat and uninteresting. The view taken at nine o'clock is far more lifelike and attractive in every respect.

Of course, it isn't always possible to find a time of day when the sunlight will produce the desired shadows. Perhaps the house or other subject is so situated that a hill or a larger building shades it during

the hours when the light would be right. In such cases, the solution is to wait for a day when the clouds are thick enough to provide a diffused light with no sharp shadows. Then a negative developed for more contrast or a normal negative printed on more "contrasty" paper will give you the best results obtainable under the circumstances.

Distant views almost always prove disappointing to the photographic beginner. The far-away range of mountains, rippling water blending into the distant shore line, and other subjects often are impressive to look at, but they don't amount to much from a photographic point of view unless special precautions are taken.

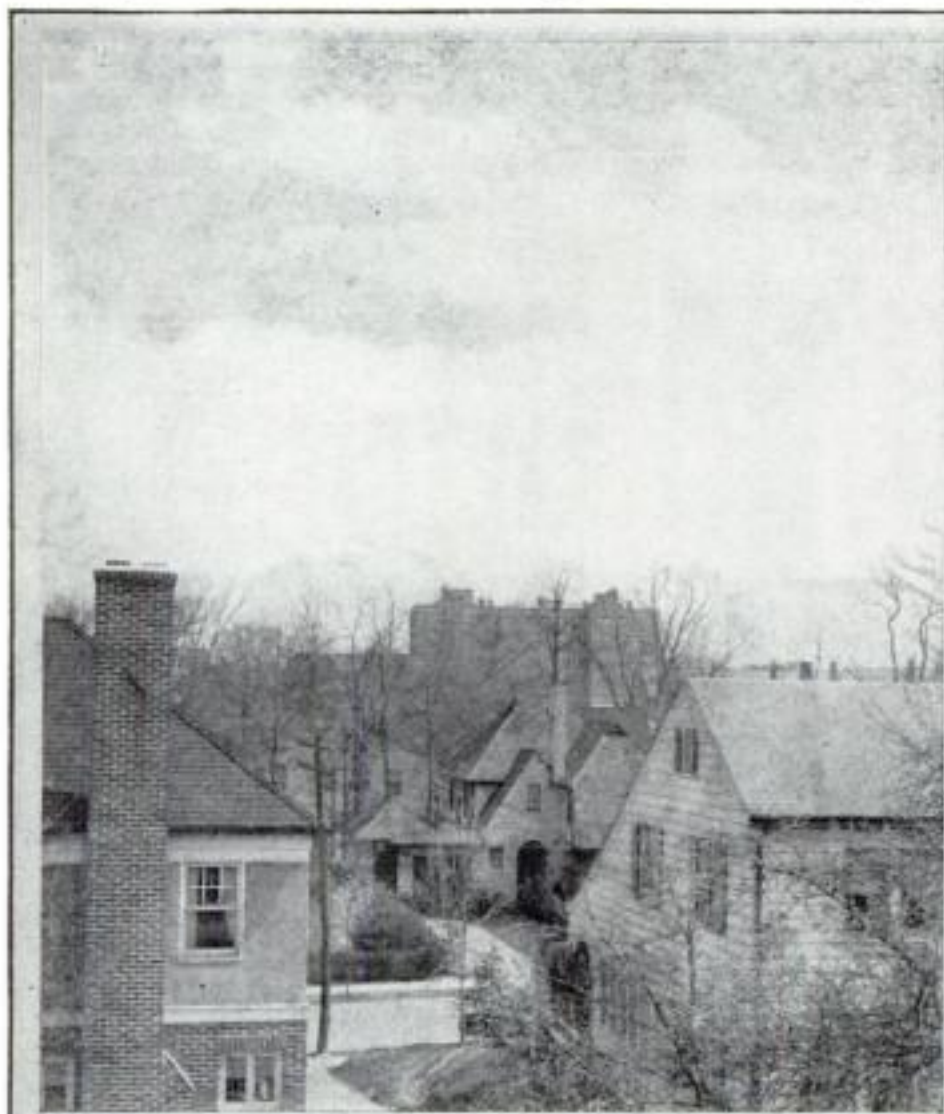
Remember that the delicate color values and atmospheric effects so often the chief charm of the distant view are lost in the ordinary snapshot. As a result, most of the area of the finished picture turns out to be plain white paper. The mountains or distant shore line become a streak of hazy, dull, and quite uninteresting gray.

In this case the solution lies in the use of a yellow filter over the lens and a correspondingly increased exposure.

The yellow filter will get rid of the obscuring blue-white haze and make the mountains or shore line appear much clearer and more distinct with relation to near-by objects. The filter cuts off a large proportion of these overactive blue rays of light and allows the image to be registered by the other rays reflected from the subject which have greater penetrating power through the atmospheric haze.

All distant views are far more interesting if the usual blank white section representing the sky shows, instead, an attractive cloud

(Continued on page 91)



No one could be blamed for passing by this photo without a second glance. The blank sky kills whatever interest there is in the scene



What a difference in this view! It was taken with a yellow filter in front of the lens when the sky was filled with picturesque clouds

HOW TO MAKE AN Emergency Condenser

• Timely Hints for Car Owners •

LAYERS of tin foil spaced by specially prepared paper constitute the condenser connected across the breaker points of the automobile ignition system. Assuming that the condenser goes bad when you are far from a service station, it is possible to work out a last resort emergency repair as shown in Fig. 1. Remove the tail-light wire, the number plates, and your shoe strings. Place the number plates with a single layer of your handkerchief between, making sure that the handkerchief cloth extends at all edges. Tie the plates together with a couple of pieces of board, if available, and connect as shown.

Tube for Radiator

A NOVEL form of radiator connection is shown in Fig. 3. Instead of a continuous piece of rubber hose between the outlet on the cylinder head and the upper radiator connection, a tube of pyrex glass is used as indicated. The ends of the glass tube should be flared sufficiently to prevent slipping. The glass tube serves as water gage and also eliminates trouble with poor circulation caused by rotting hose. The idea should be especially valuable on cars used only locally for short trips in winter, a service that permits the use of kerosene for antifreeze.

To Hold the Gasket

THERE are several ways to keep the gasket in place while refitting the oil pan. One standard way, for example, is to use studs. Figure 2 shows a simple method that calls for no special apparatus. Place the gasket on the oil pan and tie it in place at several points with fine silk thread so that the holes will be properly lined up. Bolt the oil pan to the crank case in the usual way. It will not be necessary

Fig. 2. To keep the gasket in place while replacing oil pan, tie it at several points with fine silk thread. It is not necessary to remove this thread after the pan is bolted in place

Emergency Condenser Wins a Reward

This month we award a \$10 prize to O. N. Gien, Carmel, Calif., for his plan for making a temporary repair of a condenser (see Fig. 1). Contributions are requested from auto mechanics, and if printed will be paid for at usual rates.

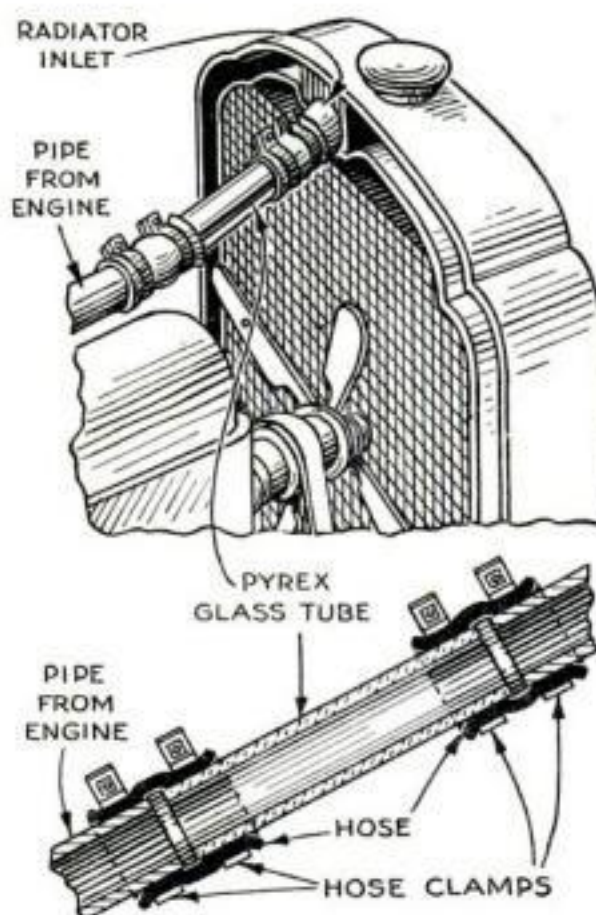


Fig. 3. A glass tube, flared to prevent slipping, can be used to form novel radiator connection

to remove the thread, as it will not interfere with passing the bolts through the holes, nor will it cause leaks.

New Valve Stem

WHEN a tire tube valve stem is accidentally broken or badly bent, it is necessary to replace it with a new one. This is difficult, as the hole in the tube into which the stem is clamped is small and the rubber at that point is usually reinforced. A solution is to cut a slit in the tube opposite the valve hole and replace through

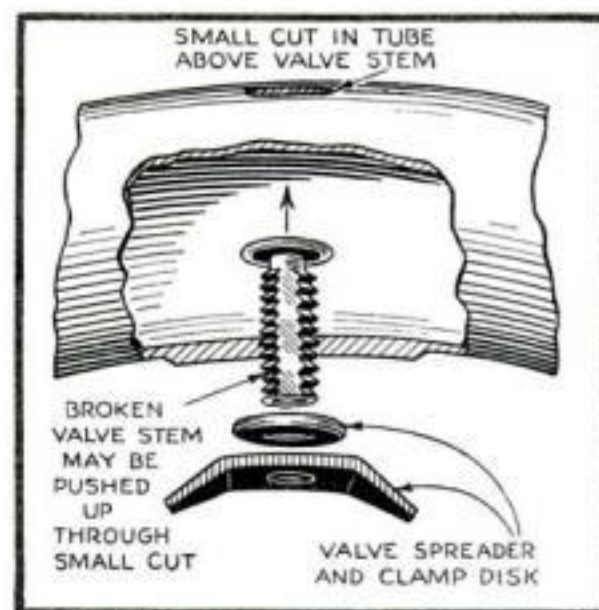


Fig. 4. To put in a new tire tube valve stem, cut a slit in tube and insert stem through it

this hole. A patch over the slit completes the operation (see Fig. 4).

A Cleaning Spray

A SIMPLE way to make the pressure in the water mains operate an engine cleaning spray is shown in Fig. 5. First fill a tank with kerosene. Then turn on the water. The water, being heavier, forms a rising layer under the kerosene.

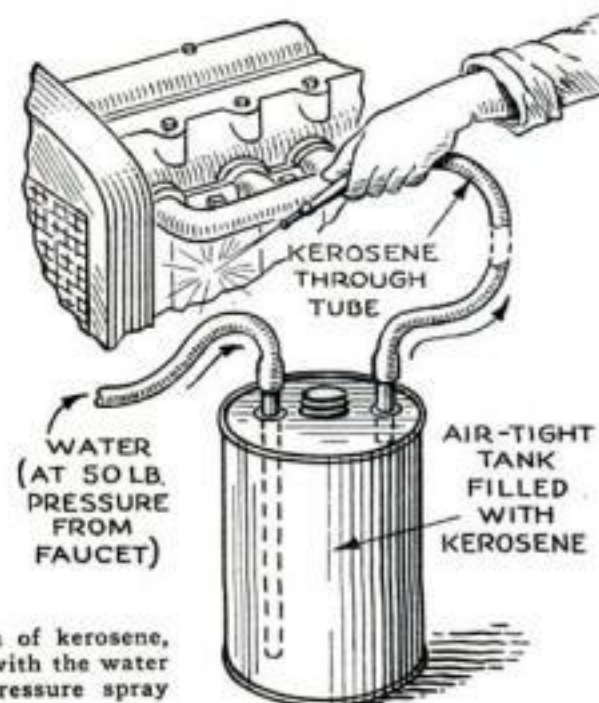


Fig. 5. Can of kerosene, connected with the water main, is pressure spray

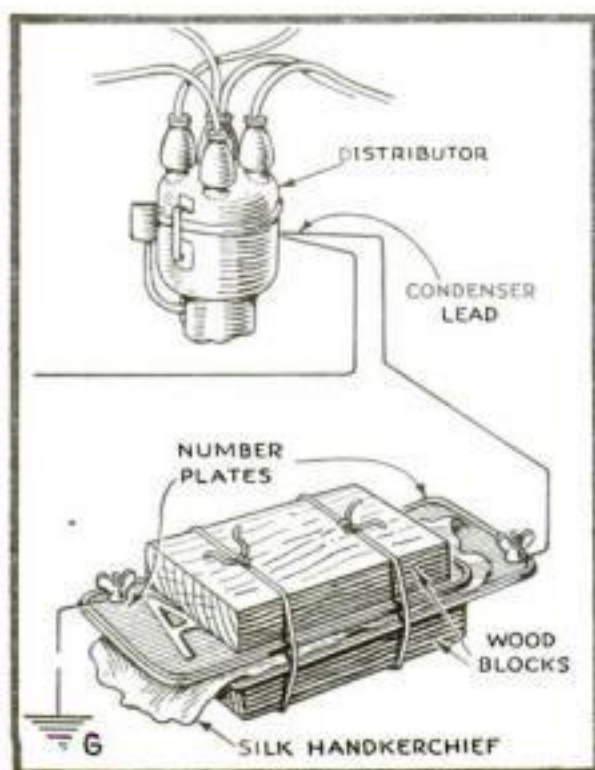


Fig. 1. License plates tied with handkerchief between serve as emergency condenser

Billions of Dollars

for

dependable employment

LARGE sums of money have been mobilized through the open market operations and the loan and discount facilities of the Federal Reserve Banks, and by loans through the Reconstruction Finance Corporation.

Here is a great credit reserve—totalling billions of dollars—awaiting dependable employment.

Just as fast as suitable jobs can be found for this credit, confidence will be strengthened, trade will quicken, and men will be returned to work.

To help speed the effective employment of this huge army of credit dollars, committees of leading industrialists and bankers

have been appointed by the Governors of the twelve Federal Reserve Banks—Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St. Louis, Dallas, Kansas City, Minneapolis and San Francisco.

Like the divisional staffs of a great army, these committees will work to consolidate our position, and straighten and strengthen our lines, so that a broad advance can be made.

Theirs is no simple task, but the readiness with which these industrial and banking leaders are joining together, and cooperating with national authorities, is a very encouraging factor in the present situation.



Housing Construction — An Opportunity

In previous depressions, a resumption of construction activity has been an important and vital factor in encouraging and stimulating business improvement. It assures employment of large numbers of men, not only directly, but also in the industries of supply.

There is undeniably an opportunity in many communities for construction of homes on a sound and economic basis, as well as a definite need for home repairs and improvements, and these matters will undoubtedly have early consideration.

The bringing together of worthy domestic building projects and substantial financing is typical of the many possibilities for beneficial action open to these committees in a wide range of fields.

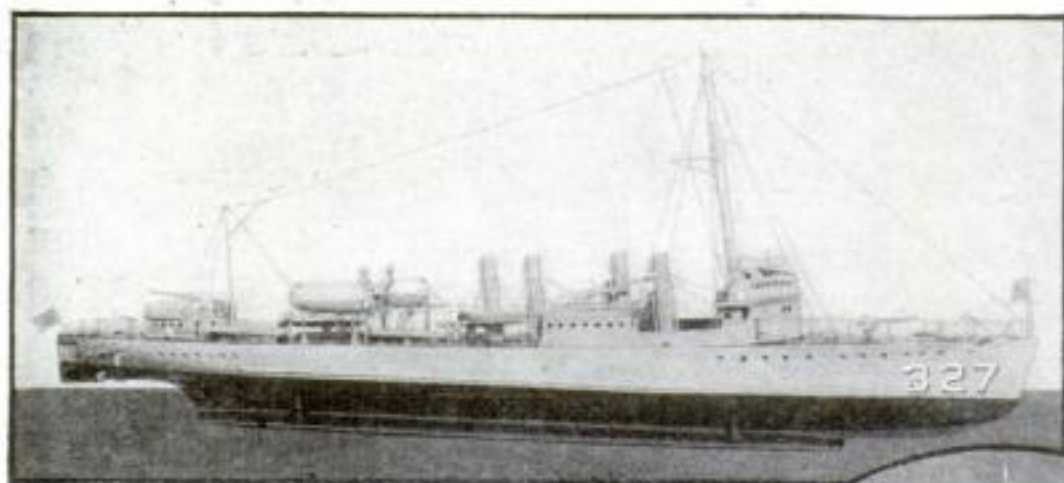
The National Publishers' Association

"As the most nearly self-contained nation, we have within our own boundaries the elemental factors for recovery."

(From the Recommendation of the Committee on Unemployment Plans and Suggestions of the President's Organization on Unemployment Relief)

SPECIAL—For Model Makers

NEW 25-CENT GUIDES FOR BUILDING
OUR MOST POPULAR SHIPS AND COACHES



Model of destroyer *Preston*, 31½ in. long, built by G. F. Brever, of San Francisco, Calif. (Popular Science Monthly Blueprints Nos. 125, 126, and 127)

IN RESPONSE to many requests from readers, POPULAR SCIENCE MONTHLY has prepared a series of handy 25-cent guides containing instructions for building practically all its ship and coach models. This task was undertaken some time ago and has just been completed. The reprints contain in convenient form the best articles ever published on model making—the articles, in fact, that made model making a national hobby.

Until these reprints were prepared, many model makers cheerfully paid 35 cents a page for photostatic copies of these very articles when they found that most of the old issues of the magazine were out of print.

Even if you do not wish to construct any of the models illustrated on this page and listed below, the short cuts, kinks, and general information these reprints contain make them excellent reference material for the model maker's library.

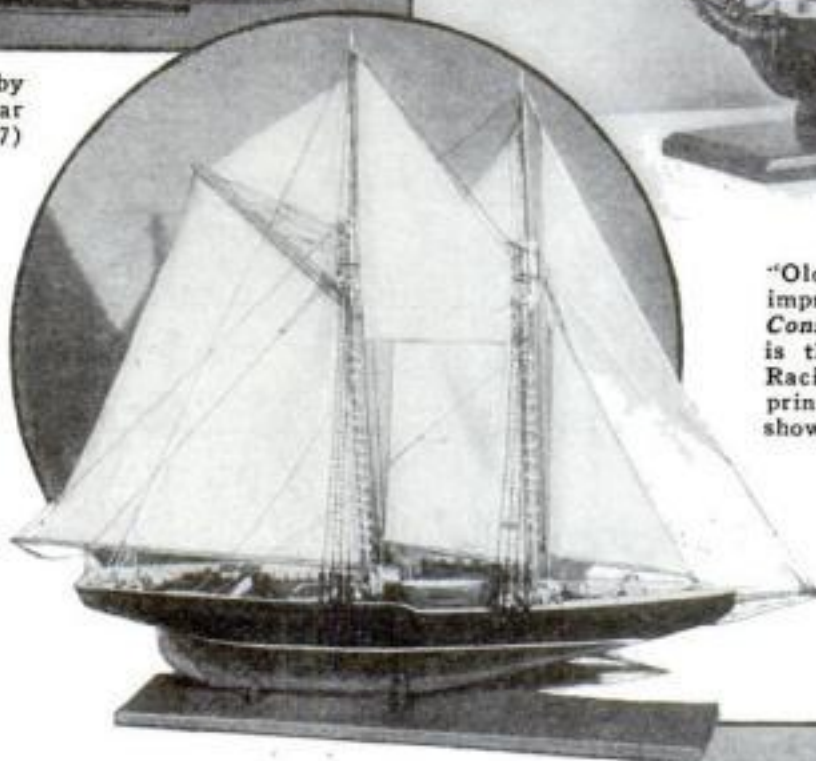
When ordered singly, these reprints are 25 cents each, but to encourage model makers to avail themselves freely of this service, a special offer of any six reprints for \$1 is made, provided the order is received before October 1, 1932. Full size drawings for each model are also available in blueprint form. In the following partial list, the blueprint numbers are given in the right-hand column.

Model	Detailed on Blueprints Nos.
Barbary Pirate Galley or Felucca.....	44-45
Clipper Ship <i>Sovereign of the Seas</i>	51-52-53
(Illustrated at bottom of page)	
<i>Constitution</i> ("Old Ironsides").....	57-58-59
(Illustrated at right above)	
Viking Ship	61-62
<i>Santa Maria</i>	74-75-76
<i>Mayflower</i>	83-84-85
Mississippi Steamboat	94-95-96
(Illustrated at right center)	
Fishing Schooner <i>Bluenose</i>	110-111-112
(Illustrated at center)	
Concord Stagecoach	115-116-117
U. S. Destroyer <i>Preston</i>	125-126-127
(Illustrated above)	

For further information and a coupon, see page 80. To save space in the list on that page, reprints are designated by the letter "R" following the blueprint numbers.

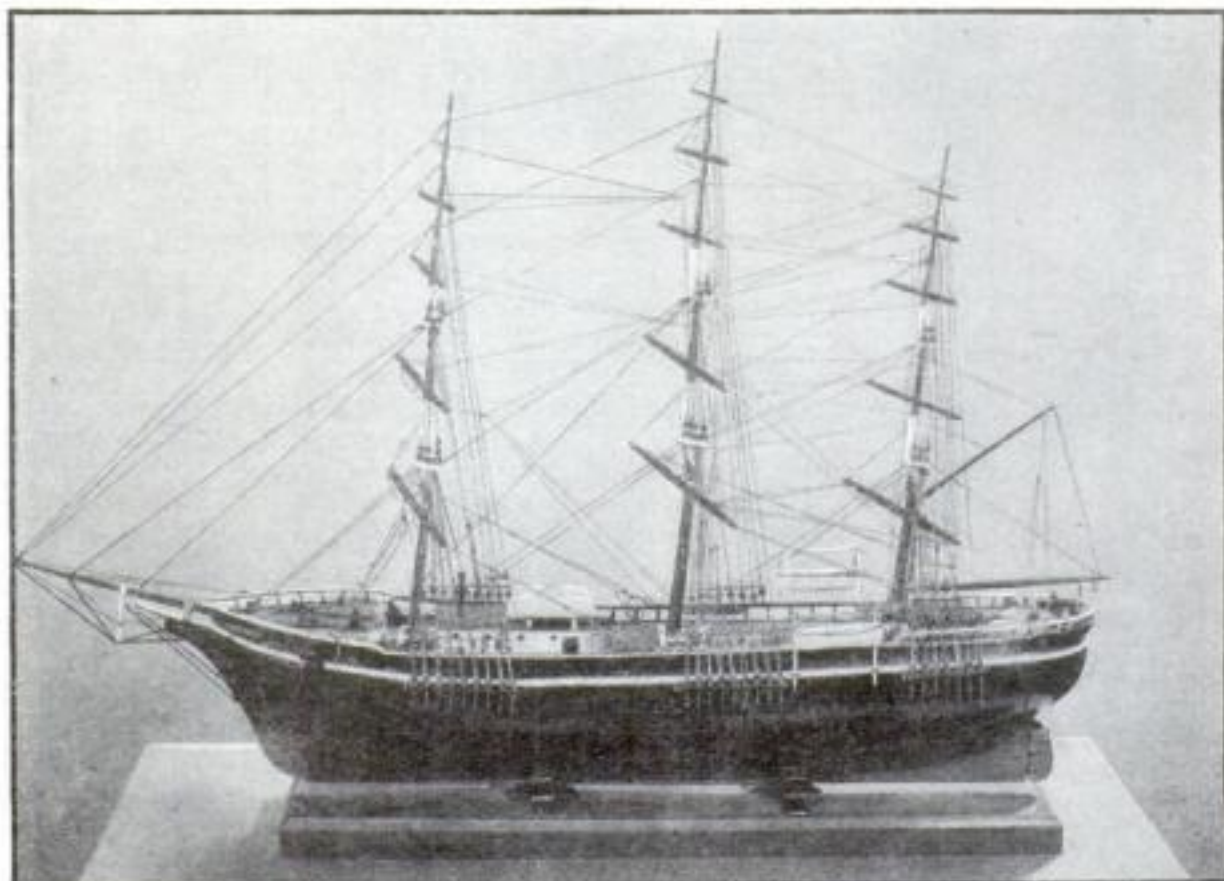


"Old Ironsides" in miniature. This impressive model of the U. S. S. *Constitution*, which is 29 in. long, is the work of William Henrich, of Racine, Wis. He followed our Blueprints Nos. 57, 58, and 59. These show how the frigate appeared in 1812



At the left is a 20 in. long model of the graceful fishing schooner *Bluenose*, which has an international reputation for speed. The model was built by W. Wilson, of New York

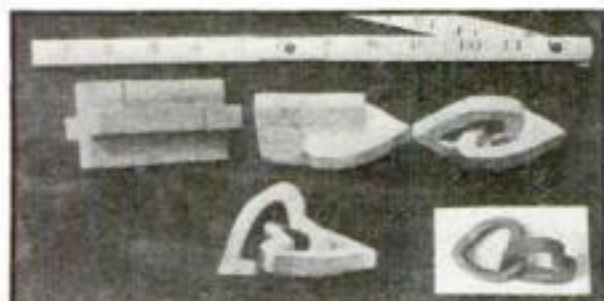
At the right is a 19½-in. model of the old Mississippi steamboat *Buckeye State*. It was made by James A. Francis, of Detroit, Mich., with the aid of Blueprints Nos. 94, 95, and 96. Below is a 24 in. long model of one of the fastest clipper ships ever built, the *Sovereign of the Seas*, by Perry D. Bradley, of San Bernardino, Calif.



Interlocked Hearts Whittled from One Block

By WALTER L. FAUROT

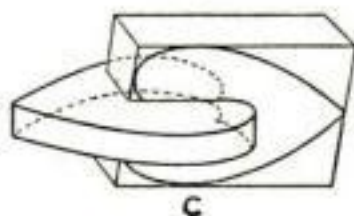
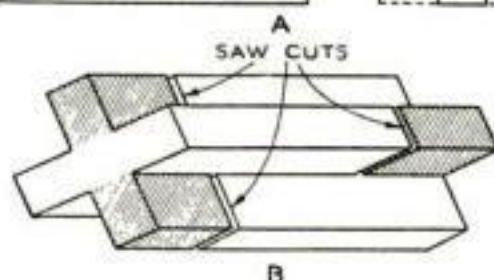
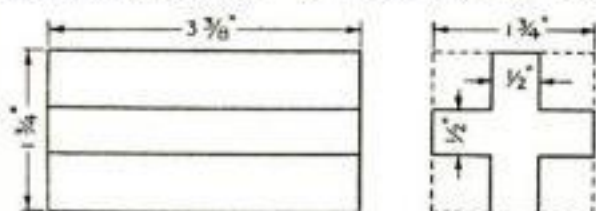
THIS pair of interlocked hearts affords a simple yet interesting exercise in whittling. Almost any wood may be used, although material that splits readily should be avoided. Soft woods are recommended for practice. The beginner will find it easier to work on a moderately large scale.



Four steps in making the interlocked hearts, and a smaller pair whittled from walnut

The hearts illustrated in four stages of construction in the accompanying photograph were whittled from pine $1\frac{3}{4}$ in. square and $3\frac{3}{8}$ in. long.

Carve or saw the block lengthwise in the form of a cross, as at A in the drawing. At one end cut away a little less than one third from two opposite legs of the cross, and do the same at the other end with the alternate legs of the cross. The cut-away portion is indicated by the



The block is cut into cross shape as at A, then roughed out by degrees as at B and C

shaded areas of B. The hearts are then roughed out in the manner shown at C.

When the hearts have been outlined in block form, draw a pencil guide line around the inner circumference of each. Cut away, little by little, all the principal waste portions, eventually severing the two sections. Wait until the two hearts are cut apart before finishing them.

The insert in the lower right-hand corner of the photograph is a smaller pair of hearts made of walnut.

Chains of any length may be made by this method simply by altering the heart shapes to that of oval or round links.

Champion's*

PATENTED EXTRA RANGE



① Note scientifically proportioned nose. Heat in this area is automatically controlled by this exclusive shape, which always keeps the nose cool enough to prevent overheating and pre-ignition.

② Note scientifically proportioned neck. Heat in this area is likewise automatically controlled by this exclusive shape, which always keeps the neck hot enough to prevent carbon and oily deposits that bring about fouling.

ENABLES YOU TO SCALE NEW PERFORMANCE HEIGHTS

The new Champion Patented Extra Range Spark Plugs top with ease all of the obstacles common to ordinary spark plugs.

The kind of service and quality of performance the new patented Champions induce, need only be experienced to be recognized as revolutionary.

Extra power, extra speed, extra acceleration are all achieved, together with easier starting

and the dependability which is universally and inseparably linked with the name Champion.

In extremes of service these new Champions prove their mettle. Put them to the test with sustained high speeds, long idling, or climbing some familiar hill or garage ramp in high. Install a full set in your car now and feel the difference... Champion Spark Plug Company, Toledo, Ohio; Windsor, Ontario.

*CHAMPION WON ITS NINTH CONSECUTIVE VICTORY AT THE INDIANAPOLIS 500-MILE RACE, EQUIPPING THE RECORD BREAKING WINNER AND ALL CARS THAT FINISHED

A CURIOUS PEDESTAL SUPPORTS THIS Round-Top Stand

DONALD A. PRICE Tells How to Construct a Copy
of a Valuable Early American Antique

AMONG the ordinary types of Early American tables with turned legs and butterfly wings, this many-faceted pedestal stand is a pleasing relief. It is modeled after an authentic pine antique of New England origin. Its height of 30 in. and the great stability of its wide-spreading feet make the stand especially suitable for giving the housewife's favorite plant a place in the sun. If desired as an occasional table, its capacity might be increased by enlarging the diameter of the top to 20 or even 22 in. without destroying its pleasing proportions.

Maple is much used for furniture of this period, and its great strength and toughness make it structurally suitable for this particular project.

In constructing the model illustrated, the pedestal was started first. A piece of maple was carefully squared to $2\frac{1}{2}$ by $2\frac{1}{2}$ by $27\frac{1}{4}$ in.—exact measurements. If stock of this thickness is not available, it may be glued up of two pieces $1\frac{1}{4}$ in. thick. If this is necessary and if it is wished to use the completed stand to support a lamp, it is suggested that a $\frac{3}{8}$ in. square hole might be provided in the center of the pedestal for the lamp cord by cutting a $\frac{3}{16}$ by $\frac{3}{8}$ in. slot in each piece before gluing them together.

Next, the mortises in the lower ends of the feet are cut. Note that they are located at two levels and that they run through from face to face. Of course, it is best to lay off the mortises on each face and cut in halfway till they meet in the center (see perspective).

Before cutting the slot in the upper end, center the stock very carefully and turn it down to the dimensions shown in the perspective detail of the pedestal. The simplest way to do this is to cut in with the parting tool at the dimensioned points to the diameters specified. Then the portion between may be rapidly roughed off with the gouge and scraped with a 1-in. mortising chisel to a straight profile between the dimensioned points.

This done, lay a thin flexible straightedge along



No matter how it catches the light, the pedestal reveals the pattern of its many facets



The stability of its wide-spreading feet makes this quaint piece a good plant stand

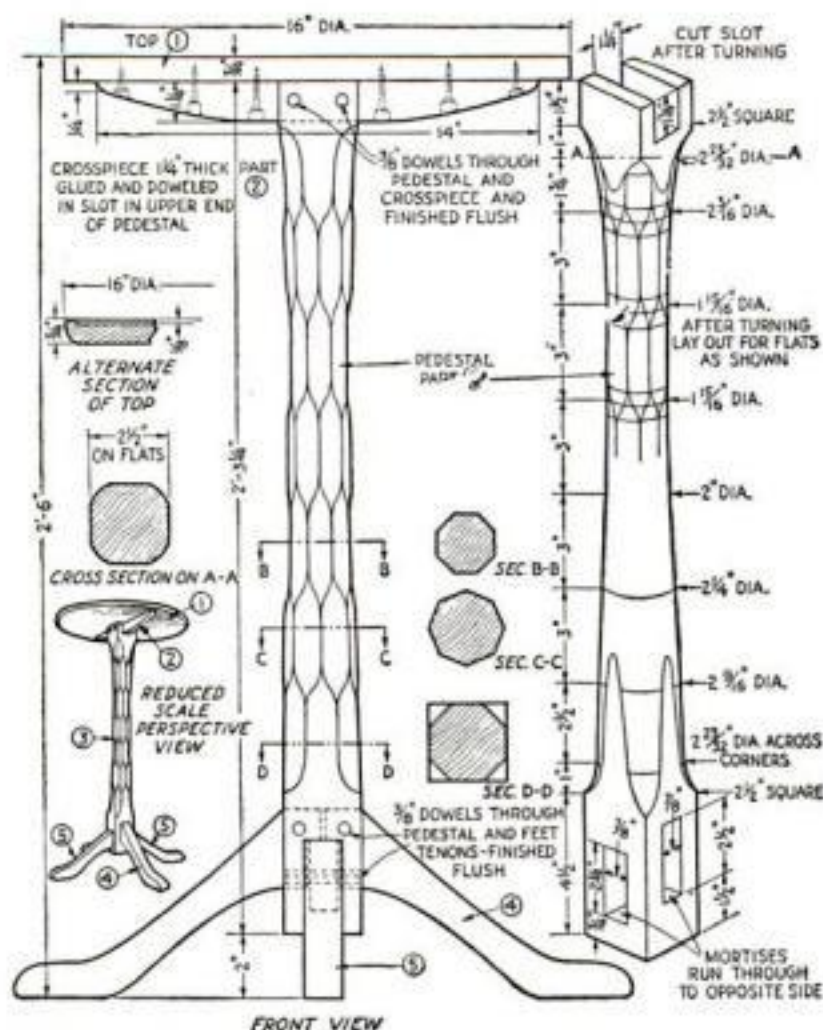
the work as shown in one of the illustrations and draw lines dividing the circumference into eight equal parts. Four of these lines register with the center lines of each face, and the alternate lines register with the corners. Then, with the work rotating, scribe pencil lines $\frac{1}{2}$ in. on each side of the dimensioned points. These rings show where the facets die out into each other, and with their aid and the aid of the longitudinal center lines, the outlines of these facets should be sketched in. A reference to the detail drawings and to the operation photo which shows the facets being filed will make this much clearer.

While the forming of the flats would seem to be a spokeshave job and was undoubtedly so done on the old-time stand, it was found that a 12-in. half-round bastard cut file was a more efficient tool for this purpose. The pedestal was covered with these flats between the penciled outlines, the filing being done with the work still on the lathe centers. Then the rough file marks were removed by the careful use of the drum sander.

At this stage it might be well to sponge the surface lightly with water to raise the grain and sand smooth again with fine sandpaper. To complete the pedestal, all that is necessary is to cut the $1\frac{1}{4}$ by $1\frac{1}{4}$ in. slot at the upper end.

The feet and crosspiece should next be cut out and fitted. After assembling them with glue, the $\frac{3}{8}$ -in. holes for the dowel pegs may be bored, and the pegs, cut long, fitted and glued in. The projecting ends are trimmed flush after the glue sets. Waterproof casein glue should be used in making these joints, especially if it is intended to finish the job with water or acid stains.

If a lathe that will swing the top is available, a raised rim as shown in the alternate section on the drawings and in the photos is preferable. However, an edge of square section will be satisfactory as far as appearance goes and is more easily prepared. The top is fastened to the crosspiece *(Continued on page 90)*



A front view of the stand with sections of the pedestal; a perspective drawing of the pedestal alone; a small sketch of the assembly; and a suggestion for giving the top a rim

SCOOP SERVES AS RACK FOR RUBBER TUBING



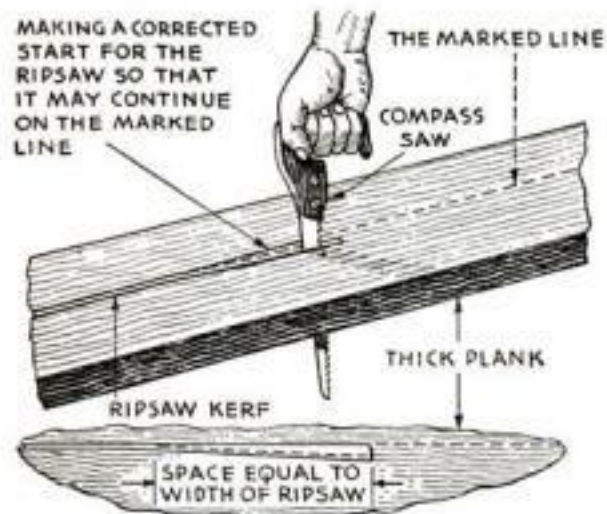
The tubing is hung over the undersurface of a scoop screwed to the side of the cabinet

TO STORE rubber tubing properly in home workshops and laboratories requires racks which will prevent the tubing from becoming kinked or compressed. The tubing rack illustrated does this and is simple, inexpensive, and satisfactory. It is made from a hand scoop like that shown lying on top of the cabinet. The wooden handle is removed, and the scoop is nailed or screwed in an inverted position to the wall or any convenient vertical surface.—HORACE H. SELBY.

HOW TO COAX A RIPSAW BACK INTO LINE

IT IS often difficult to make a rip saw follow the correct line in wood that is 2 in. or more in thickness. When the saw is departing from the line, however, it may be brought back in the following manner:

Starting from the end of the cut or kerf, use a compass saw to widen by gradual degrees one side of the kerf (depending upon which way you wish to draw the rip saw). Do this by pressing the teeth of the compass saw toward the required

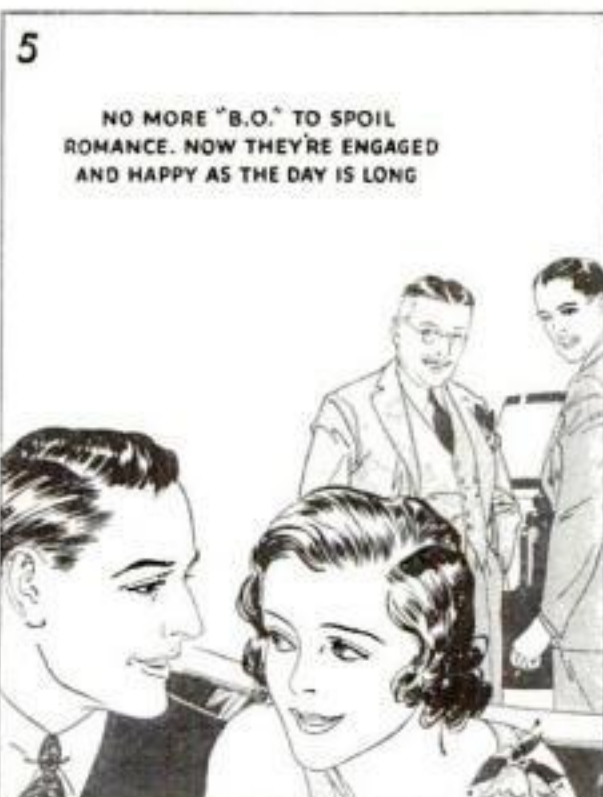
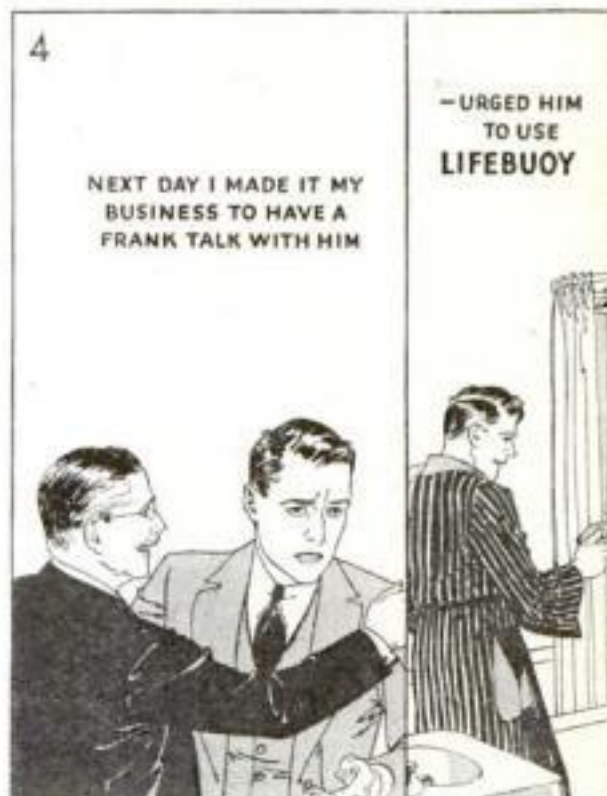


When a rip saw runs off the line, it is easy to make a new start by using a compass saw

side. When the widened kerf is as long as the rip saw is wide, the latter may be replaced and pressed against the proper side of the cut. A few strokes will then align it in the proper direction.

If the set of the saw is very much out of true, this process may have to be repeated several times in sawing a long piece of timber, but a fairly straight kerf may be obtained in this way even with a poorly set saw.—H. O. CARRINGTON.

STRAIGHTENING A TANGLED ROMANCEby ALBERT DORNE



"B.O." wrecks (body odor) fondest hopes

ROMANCE—business or social success—may be seriously endangered by this unforgivable fault... "B.O." (body odor). Keep safe by bathing regularly with Lifebuoy. Its creamy, abundant lather purifies and deodorizes pores. Helps safeguard health, too, by removing germs from hands. Its pleasant, extra-clean scent vanishes as you rinse.

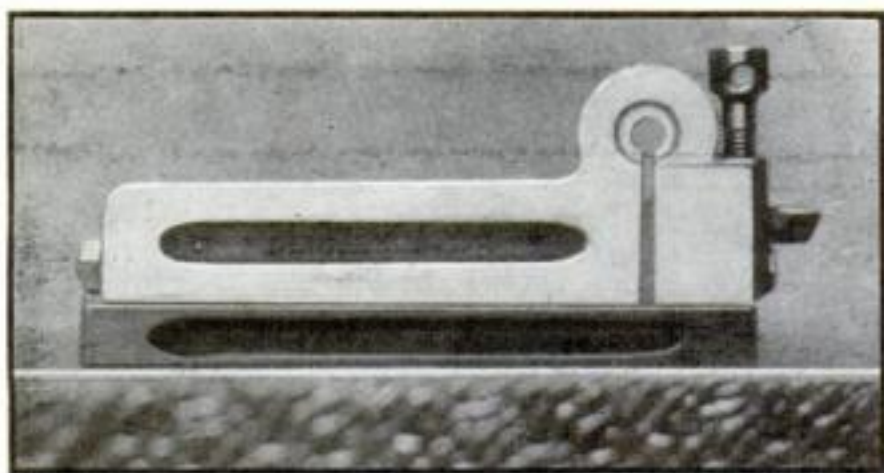
Great for the skin

Lifebuoy's pure, bland lather cleanses gently and safely—makes dull skins glow with healthy radiance. Adopt Lifebuoy today.



A PRODUCT OF LEVER BROS. CO.

Improved Gooseneck Threading Tool Insures Accuracy



A bolt running through this gooseneck threading tool prevents the bit from recoiling too far and making wavy threads

so that the springing of the neck is not interfered with. At the same time any flexure sidewise is prevented by the conical inside of the bolt head, which rests on the seat in the head

below the bit. In the slot beneath the neck a flat piece of sole leather is fitted so as to be loose when the nut is slack. When the nut is tightened, it not only grips the leather, but also puts considerable tension on the neck with its split collar.

The high-speed bit is 5/16-in., and for acme and coarse square threads is ground with a small wheel slightly concave on the top so as to have a little rake. The bit is held by the set screw as shown. After the entire holder has been hardened and drawn to a dark blue, the sides and bottom are ground true with the bit to facilitate setting up.

In using the tool, the bit head is tightened against the leather for taking the

roughing cuts, but when the thread is nearly to size, instead of attempting to move the slide rest of the lathe, the nut is slackened slightly, which gives the neck a chance to spring outward, carrying the bit point farther into the work to make a slightly deeper cut.

When the point of an ordinary gooseneck tool springs away from the cut to prevent chattering or digging in, there is nothing to check it on its return from recoiling too far, and threads cut with such tools, while they may shine and look smooth, are found to be wavy when carefully examined. When once the tops of the "waves" wear off, the nut becomes too loose; or, in the case of a worm, the lumps soon cut into the bronze and make trouble. With this tool, however, the cutting bit is prevented from recoiling too far by the head of the bolt, which limits this inward travel to the exact point where it started when it began to back away. Thus the tool cuts not only a smooth but a true surface on the thread.

The bolt also keeps the tool from springing sidewise on heavy work and distorting the lead of the thread. The sole leather, being slightly compressible, allows sufficient recoil from hard spots in the work and therefore speeds up the roughing out operation, as heavier cuts can be taken.—G. J. MURDOCK.

Old Bill Says..

PLACING a small mirror on the work next to the starting tap will enable one to detect the slightest error in squareness without the aid of a square.

To keep drawings clean, paste them on cardboard and cover with transparent wrapping material of the cellophane type.

A ten-cent piece of camphor ice, broken up and distributed inside the tool box, is a preventive against rust.

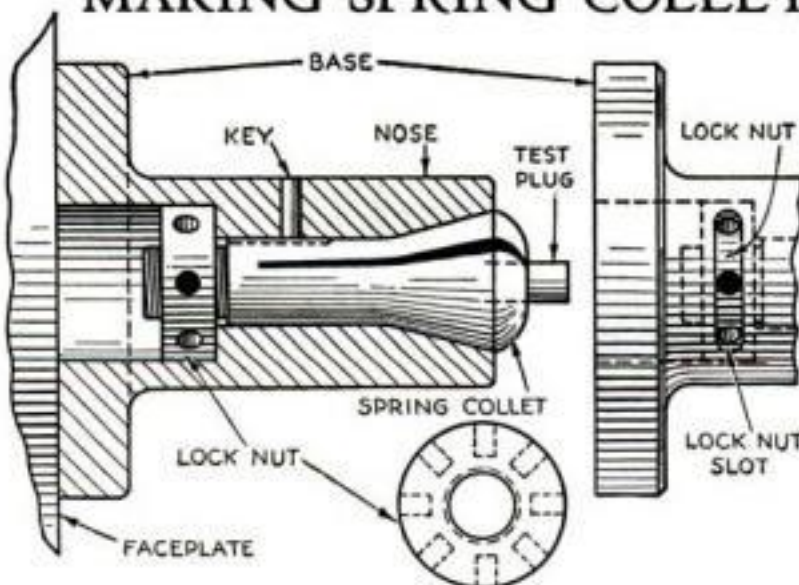
Have the reamers you are using chromium plated for about one inch on the cutting end, then note the difference in the period of elapsed time between grinds.

Watch the cemented belts on your machines to see if they require shortening. When they do, plan to have the work done at a time that will cause no appreciable delay in the jobs in the shop.

A good method of testing the outlet of pipes which have been welded is to drop a steel ball in the opening and let it roll through.



MAKING SPRING COLLETS RUN TRUE



How the special collet holder is machined. The draw-in nut is turned through a slot near the base of the holder

SMALL spring collets or chucks, even when new, do not always hold work so that it runs perfectly true, and as they become worn this gets worse. To use such chucks successfully, the holder shown was made. It is strapped to the faceplate of the lathe, after which a testing plug is put into the collet, and the base of the holder

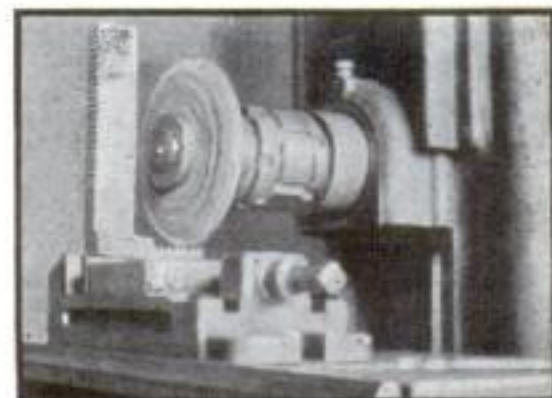
tapped until the plug runs exactly true as shown by an indicator in the tool post of the lathe. The plug is then removed, and the work to be turned or ground substituted for the plug. When the straps have been tightened, the work can be finished with the assurance that it will run true even if removed and replaced in the chuck, or turned end for end.

This holder is also handy for holding spring chucks on the milling machine table, surface grinder, or dividing head as it is self-contained.

It is preferably made of tool steel and the nose hardened and ground, but may be made of cast iron or from a machine steel forging. A slot is cut near the bottom of the nose of the device for inserting a pin with which to tighten or slack the draw-in nut by which the collet is opened or closed.—G. M.

REPAIRING PIPE WRENCHES

IT DOES not pay to take chances with worn-out pipe jaws. The photograph shows the set-up for grinding the teeth in the hook jaw, and the heel jaw is removed from the handle and ground in the same way. Both jaws, of course, should first be resurfaced. Alundum wheels of the 60 J grade or their equivalent will give satisfactory results, an angle being formed on the wheel to duplicate the original teeth.—L. N. D.

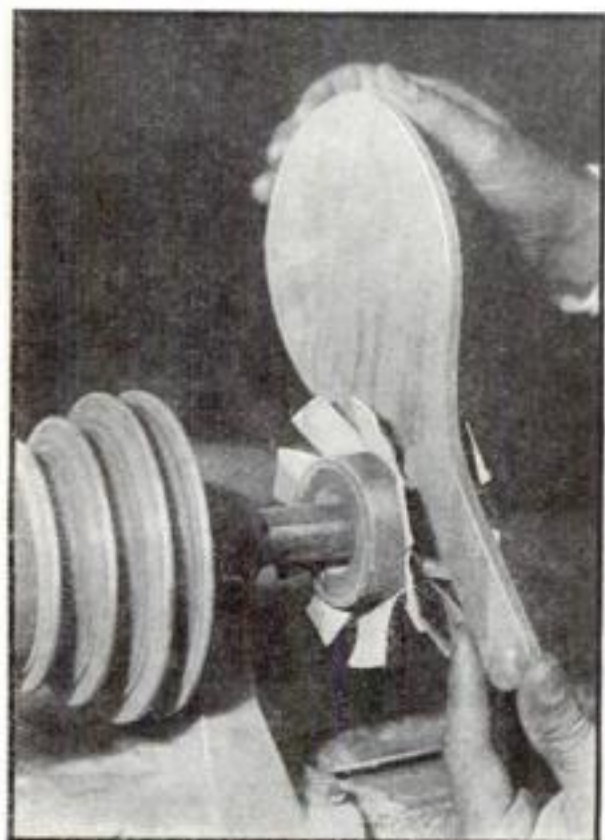


A QUICK WAY TO BEVEL ROUGH WOODEN EDGES WITH SANDPAPER



After being slitted, the sandpaper was held around the sanding drum with a rubber band

IN THE accompanying illustrations is shown a novel and exceptionally rapid method of beveling the edges of a number of irregularly shaped pieces of wood. It was devised by a workman who had to turn out 1,000 neatly finished paddles for a bazaar concession. These were band-sawed six at a time from $\frac{1}{4}$ in. thick plywood. Then a strip of rather coarse and heavy sandpaper $2\frac{1}{2}$ in. wide and of a suitable length was prepared by cutting a series of alternate slits from each edge to the center. The slits were 1 in. apart. The strip of sandpaper was next wrapped around a 2-in. sanding drum with the ends lapped in the direction of rota-



At high speed, the flaps of sandpaper flared out to form a channel for beveling the work

tion and held by passing several small rubber bands around the center as in the upper photograph. When the drum was speeded up to about 2,200 R. P. M., the flaps of the sandpaper flared outward because of the centrifugal force and formed a sort of V-shaped groove. The edges of each paddle were run through this groove, and the sandpaper removed the rough edge and made a bevel.—D. V. H.

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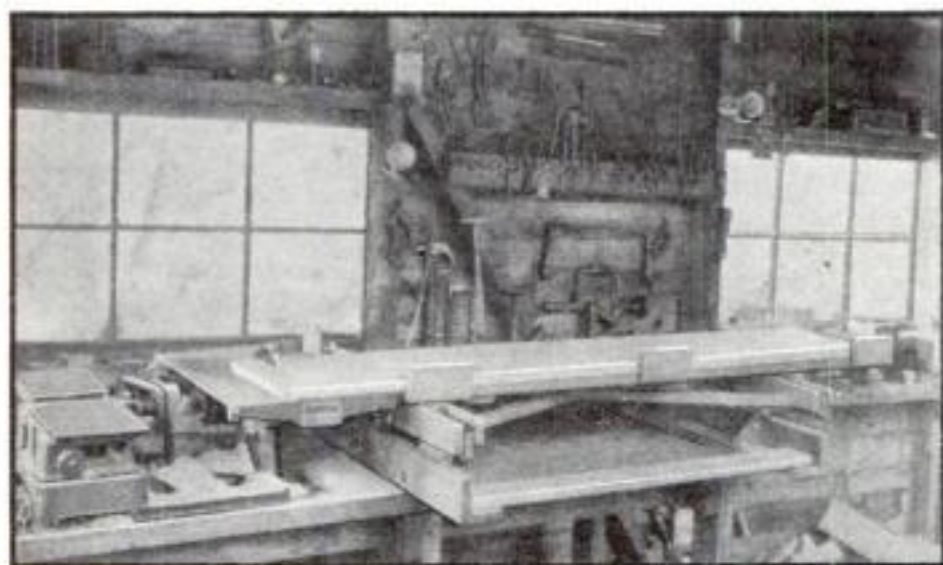


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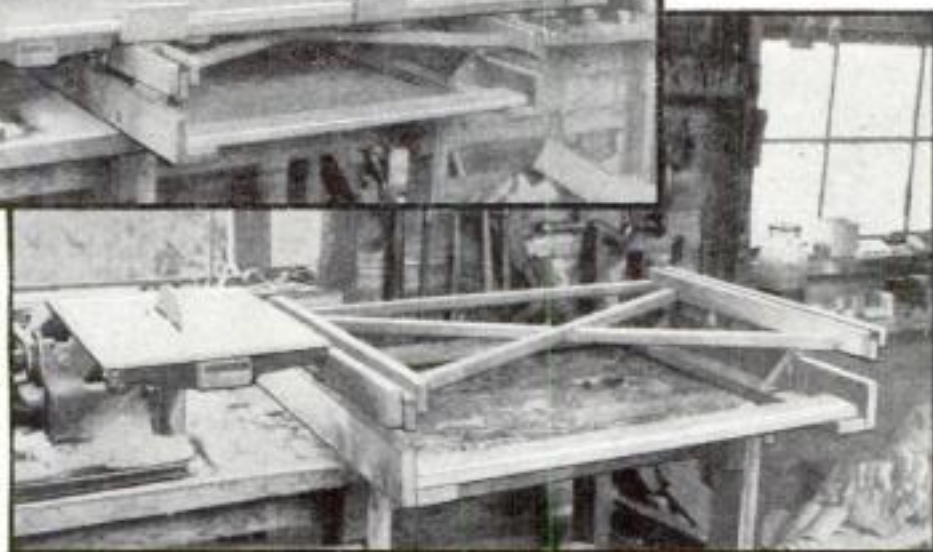
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Sliding Extension Table

Improves Small Circular Saw



Stock up to 15 ft. in length and 12 in. in width can be cut with accuracy on a small circular saw when the extension shown at the left is used. The top rests on the frame shown in the photo below



By A. V.
COMINGS

THE usefulness of almost any small circular saw may be greatly increased by adding an auxiliary sliding table such as the one illustrated. This enables the operator to cut with accuracy stock up to 12 in. or more in width and as long as 10 or 15 ft. The small table and short fence of many home outfits limit the crosscutting range of the machine to stock 6 or 7 in. wide and but a few feet long if accurate cuts are to be obtained.

The auxiliary table is made entirely of stock 1 in. thick, put together with 1½-in. No. 8 screws. The base consists of two right-angle members, each made by fastening together two strips 3 in. wide and 3 ft. long. These are held in place by cross-pieces, front and back, and they are also braced rigidly by four right angle knees.

On this base is mounted, by means of two uprights on either side, the top unit that carries the sliding table. The uprights are of 1 by 4 in. stock and of the proper height to bring the sliding table top level with the saw table top when the outfit is in place.

The top unit consists of two grooved assemblies made as shown. These are rigidly braced by diagonals and a cross-piece at the rear. Each grooved assembly consists of a bottom member, which is fastened to the uprights from the base, and two guiding members of the same length fastened to either side of the bottom piece.

The sliding table top, which carries the board to be sawed, is a 1-in. board 1 ft. wide and 3½ ft. long. To the underside of this are fastened two slides which travel in the grooved assemblies. These slides are approximately 2 ft. long, and they must be rigidly fastened to the table top. At the front of the sliding table, and extending 2

in. above it, are fastened three stops, as shown, against which the back edge of the board to be sawed rests.

Cup grease should be smeared sparingly in the grooves to make the table operate easily.

In building this table, remember that it will cut accurately only if the sliding table moves in an exact right angle to the plane of the saw blade; therefore see that the carriage grooves are absolutely parallel and the slides under the table top at exact right angles to the back edge of the top. If the table is built true in these details and the saw is set at right angles to the auxiliary sliding table, all cuts will be accurate.

The auxiliary table shown is fastened to the bench by four screws. It may be placed in position or removed in about one minute's time. When not in use, it is hung on hooks from the shop ceiling, where it is out of the way.

THREE HINTS FOR THE SHIP MODEL MAKER

A PIECE of ruled paper placed between the shrouds and the mast on a sailing ship model will help in spacing the ratlines evenly and keeping them level with the hull lines. A sharpened toothpick or a pin used as a paintbrush with artists' oil colors makes fine, even lines for ship model decorating. Realistic furled sails can be made by rolling a triangular piece of thin cloth tightly from apex to base line—in order to make the roll thickest at the middle—and tying it in the middle. The roll is then wrapped with the cord wound in opposite directions from the center to the ends.—R. W. BURGESS.

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This brightly enameled little red lantern can be hung on a nail or hook wherever it's needed, or carried in your hand. You'll find a dozen uses for it, indoors and out. At all leading stores. Only 49 cents, complete with batteries!

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For this month's new blueprint projects see pages 57 and 64

TO ASSIST you in your home workshop, POPULAR SCIENCE MONTHLY offers large blueprints containing working drawings of a number of well-tested projects. The blueprints are 15 by 22 in. and are sold for 25 cents a single sheet (except in a few special cases). Order by number. The numbers are given in italic type and follow the titles. When two or more numbers follow one title, it means

that there are two or more blueprints in the complete set. If the letter "R" follows a number, it indicates that the blueprint or set of blueprints is accompanied by a special reprint of the instructions originally published in the magazine. If you do not wish this reprint, omit the letter "R" from your order and deduct 25 cents from the price given. Reprints alone are sold for 25 cents each.

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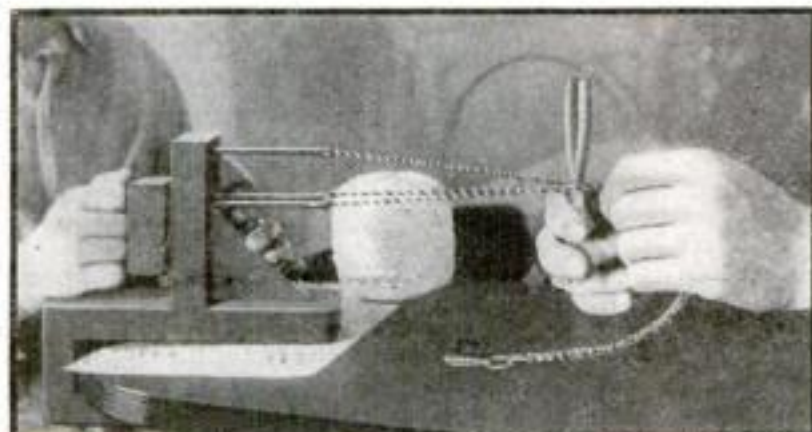
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Simple Homemade Machine Twists Colored Cords for CRAFT WORK



By
HUBERT E. MISHLER

ORNAMENTAL cords for many purposes can be made with this simple little machine; for example, a Boy Scout lanyard for knife or whistle, a dog leash, fancy cords for hanging pictures, a watch fob or a cord for attaching penknife and watch, and pull cords for a floor lamp.

Cut a strip of wood $13/16$ or $7/8$ by $2\frac{1}{4}$ by $19\frac{1}{2}$ in., square up the edges and ends, then cut off the following pieces: base, 7 in. long; upright, 4 in. long; crank block, $2\frac{1}{4}$ in. long; bracket, $2\frac{1}{4}$ in. long and triangular in shape; hook blocks, $1\frac{1}{4}$ in. and 2 in. long.

After all have been cut and sanded smooth, temporarily fasten the crank block to the upper end of the upright member. Scribe a $1\frac{1}{4}$ in. diameter circle in the center of the crank block, and divide the circle into three parts with one point at the top center. Bore three holes slightly larger than the wire you intend to use for the crank, through the crank block and upright.

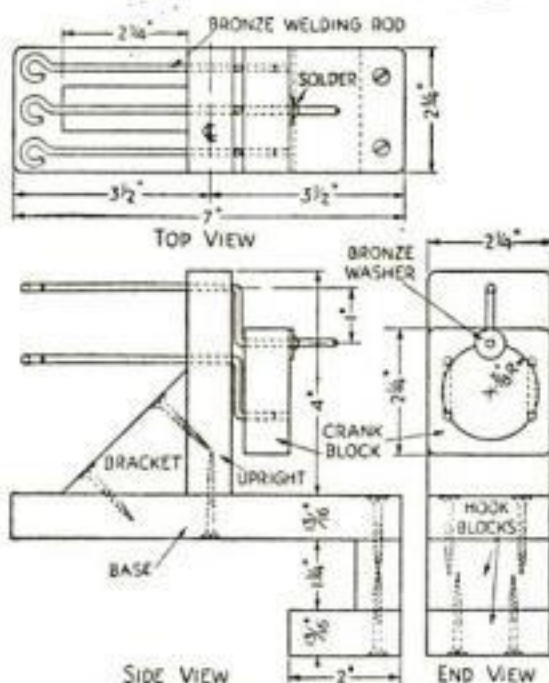
Next bend the crank end of the wires. Each should have the same offset—1 in. Be sure that all are the same. If upon completion the cranks should bind in the crank block, enlarge the holes in the latter. Insert the long handled top wire into the crank block; then cut a $\frac{1}{2}$ in. diameter copper or bronze washer and solder it to the wire crank.

Assemble the wood members with nails and glue or screws. Insert all crank wires and carefully bend hooks on the ends. Finish with two coats of lacquer.

Obtain three balls of twine of different colors and preferably of a hard finish. Try to get twine that is all twisted in the same direction. The direction of the twist which makes the strands of the twine tighter is the direction in which the machine must be operated. If your white twine is twisted opposite to the colors, operate the machine to tighten the twist of the majority of strands.

Start the twine by tying one end securely onto one hook. Have someone hold

As the crank block is revolved, the three groups of twine are individually twisted and come together to form a decorative cord



How the machine is made. It is important to give all cranks exactly the same offset

a snap or ring (which can be purchased at a hardware or sporting goods store) at a point one third farther away from the machine than the length you wish the finished cord to be. The twine should then be threaded back and forth from one point to the other and finally tied at the starting point. Twelve strands will make a cord about $3/16$ in. in diameter. Do the same with the two other colors.

Hold the snap tight and start cranking to increase the natural twist of the majority of strands. When the strands begin to kink, use the handles of a pair of pliers to separate the three groups of twisted twine, and then begin pulling and twisting behind the pliers. You will soon see that the finished cord almost forms itself. Continue the cranking until the hooks are reached. Remove and tie the three groups of strands to each other.

More intricate combinations can be created by dividing the colors instead of using only one color on each hook.

DISCOVERED "SECRET" OF PIPE SATISFACTION TEN YEARS AGO

His "Secret" shared
by Thousands today

TEN years ago Mr. J. Franz Norgren of Madison, South Dakota, was still engaged in the search well known to every pipe smoker—the search for the ideal tobacco. Then one day his seeking was rewarded. He found it at last in Edgeworth! For some time he believed he had stumbled upon a "secret." But as the years passed he met up with the "little blue tin" with increasing frequency. Mr. Norgren's letter tells the story of his discovery.

Madison, South Dakota,
December 25, 1931.

Larus & Bro. Co.,
Richmond, Va.

Dear Sirs:

Today, Christmas Day, I received a half-pound of Edgeworth from a friend. That's a real gift! Ten years' intimate acquaintance with this excellent tobacco only intensifies my approval of a friend's good judgment.

When I first smoked Edgeworth, I thought I had discovered a secret. I had no idea before how satisfactory a fine blend could be. I came to look upon a good pipe packed with Edgeworth as a point of distinction wherever I might be. My observations since have upheld my theory. I meet up with the little blue tin with ever-increasing frequency.

Living in the country, a fellow gets to be particular about tobacco. To my mind, Edgeworth is the one tobacco that shows up best in any circumstances. At work or at leisure, there's no pal that comes up as cheerfully and that lends itself so perfectly to the moods of man and nature as another pipe of Edgeworth.

The point is, though, Edgeworth isn't the secret I thought it was. It's out—such things don't stay secret when you have friends.

Very truly yours,
J. Franz Norgren.

Are you one who has never known the genuine satisfaction of a good pipe and good tobacco?

Then take up your pen right now and drop a line to Larus & Brother Co. at 110 S. 22d St., Richmond, Va., and ask for a free sample packet of Edgeworth Smoking Tobacco. Edgeworth is a *different* tobacco. It is cool and slow-burning. Its blend of choice burleys with the natural savor sealed in cannot be matched—regardless of price or fancy packaging. Put Edgeworth in your pipe and smoke it.

You can buy Edgeworth in two forms—Edgeworth Ready-Rubbed and Edgeworth Plug Slice. All sizes from 15-cent pocket packages to pound humidors. Several sizes also come in vacuum sealed tins. Don't miss the Edgeworth radio program—the Corn Cob Pipe Club of Virginia—broadcast over the Coast to Coast Red Network of the National Broadcasting Company every Wednesday evening at 10 o'clock, Eastern Daylight Saving time.



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Smooth-On No. 1 after set and metallized holds water, steam, gasoline, oil, etc., under any pressure, and may be applied with equal success to any metal. Use it also for anchoring and taking up looseness. Makes loose bolts, nuts, screws, etc., permanently tight. Holds in masonry, tiled walls, slate, wood, etc. Keep a can of Smooth-On No. 1 in your tool box and be ready for emergencies. The free Smooth-On Repair Book gives full instructions.



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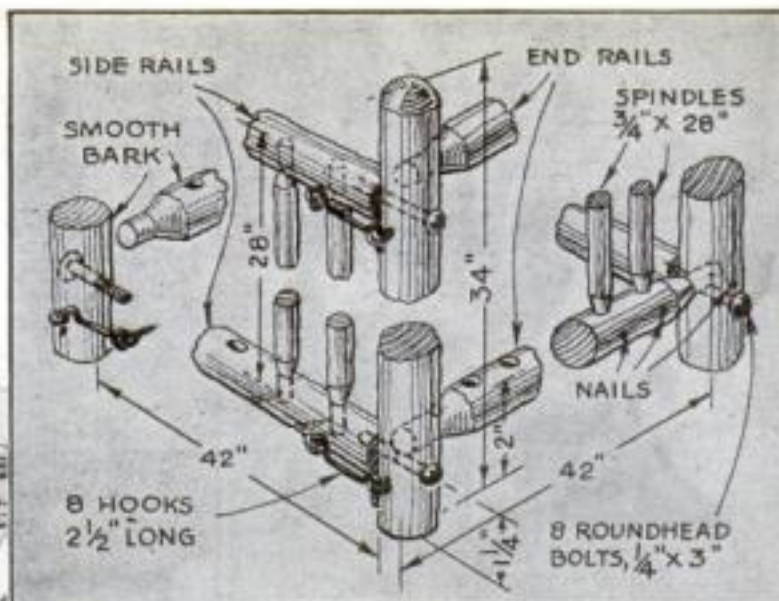
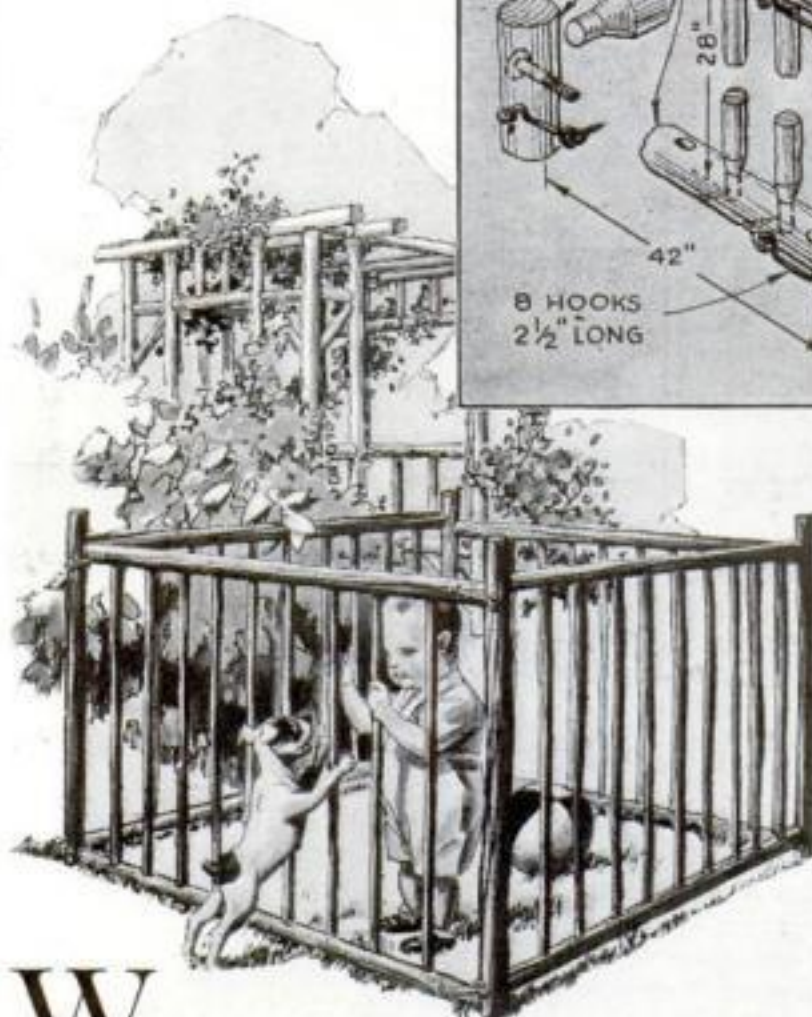
3 1/2" scale. Ben Howard's Chicago race winner. Colored with Cleveland's new white dope. Span 15 1/2"; length 13 1/2"; weight 1.2 oz. Complete Kit \$1.15 with everything needed, mailed post free for only \$1.00.



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The baby's play pen sketched below blends into a garden setting better than the ordinary painted inclosure. Details of the joints are shown at right



A Rustic PLAY PEN for the Lawn

WHEN used outdoors in the garden or at a summer camp, the ordinary type of baby's play pen, being light colored and conspicuous, is less appropriate than one made of rustic materials like that illustrated.

To construct such a play pen, the following are required: 4 posts from 1 1/2 to 2 in. in diameter and 34 in. long; 8 rails of the same diameter and 42 in. long; from 32 to 36 spindles from 3/4 to 1 in. in diameter and 28 in. long; 8 hooks 2 1/2 in. long with the necessary eyes or staples; and 8 roundhead bolts 3 by 1/4 in. All the wood should be straight and have reasonably smooth bark.

Match the rails for each end and side, putting the lighter ones at the top. Dress down the ends of the rails that are to be used for the two end assemblies so they will enter 7/8-in. holes in the posts. Lay out equally spaced holes in the rails for the spindles. Bore the holes with a 3/4-in. bit and assemble and nail the two end assemblies and the two side assemblies. Then bore 7/8-in. holes 2 in. from the bottom of the posts to receive the lower rails of the end assemblies. By putting the

lower rails in these holes, it can be seen where to bore the holes for the top rails. Put on the posts, drive the end assemblies together, and nail.

Leave the ends of the side rails square and bore holes endwise into them large enough to allow a 1/4-in. bolt to enter easily. Mark up 1 1/4 in. from the bottom of the posts and bore 1/4-in. holes corresponding to the holes in the lower side rails; then drive a 3 by 1/4 in. bolt into each post from the outside to serve as dowel pins. Bore the upper holes through the posts to match the holes in the ends of the upper side rails, and put in similar bolts. Assemble the entire play pen and add the eight 2 1/2 in. long safety hooks as shown in the drawing.

I oiled and varnished the one I built, and, besides being sturdy and weather-proof for outdoor use, it is fine enough even to use inside. It can be taken down and set up in a couple of minutes.

If thought necessary, a floor can be added by cutting lumber long enough to extend beyond the bottom end rails and nailing 1 by 2 in. cleats on the floor outside the rails.—A. C. SHUMAKER.

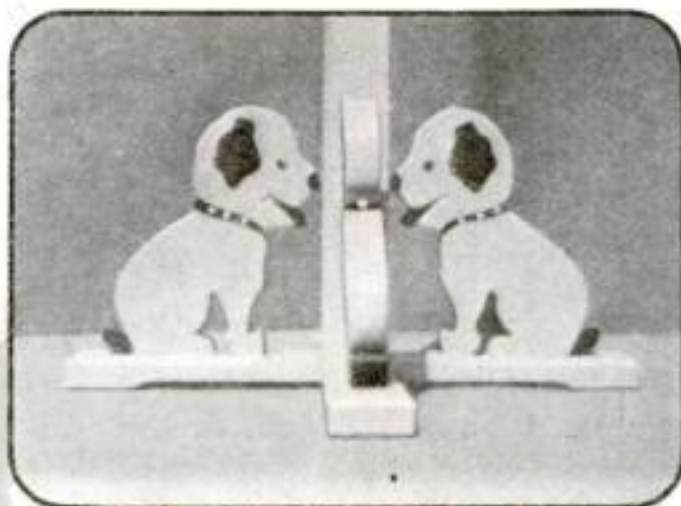
SOAP PASTE PROTECTS HANDS FROM GRIME

MANY mechanics, home workers, and handy men know the useful trick of rubbing their hands with a heavy lather of soap and letting it dry before starting any job that is likely to leave their hands grimy or spotted with paint or other materials difficult to remove. Better than soap alone for this purpose, however, is a mixture made as follows: Place 1 qt. of soap chips or powdered soap in a mixing bowl and add a tablespoon of gum arabic which has been dissolved in hot water.

If preferred, dextrine may be used instead of gum arabic. Whip the mixture to a paste with a scant quart of water. While beating, add about half a teaspoonful of glycerine and, if desired, several drops of perfume. When the mass has become creamy, put it up in preserve jars for future use. Before beginning a disagreeable job, rub this protective paste into the hands and under the nails. It quickly dries, free from stickiness. To clean the hands, wet to form a lather.—R. W.

Four Jig-Sawed Puppies Brace This Child's Costumer

By ANTHONY T. PUSCIZNA

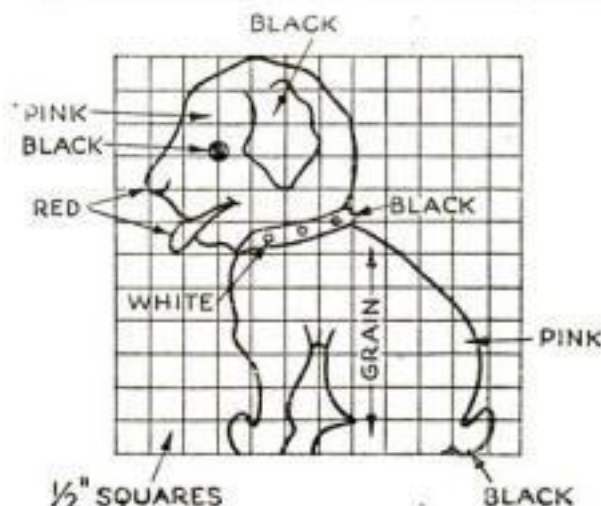
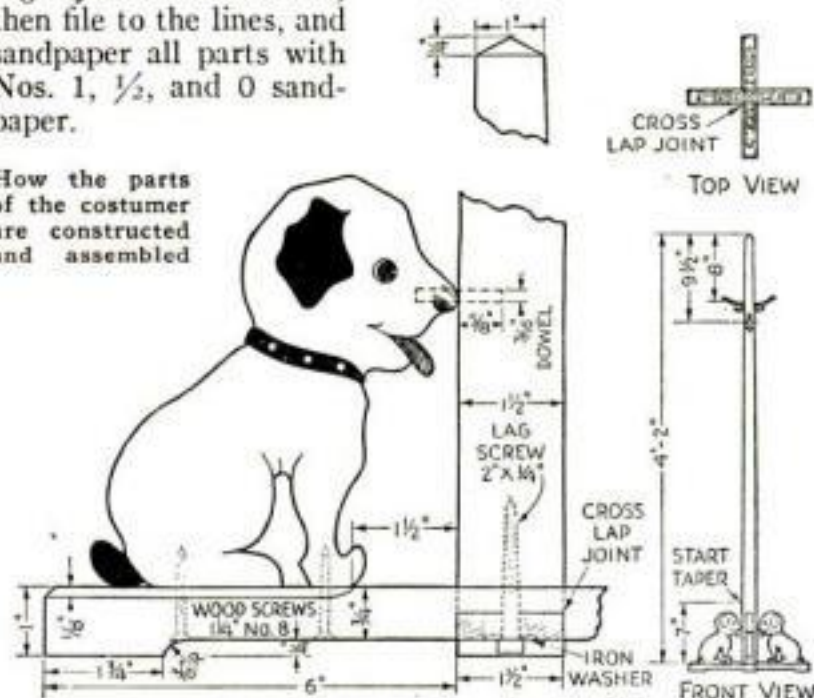


The finished costumer, a close-up of the base, and, below, the pattern for the puppies. The shaft and base are light blue, and the puppies are colored as indicated on the drawing below

THIS costumer will find a welcome place in every home where there are children. For hard usage, maple or birch are especially suitable, but almost any wood will serve. Prepare the stock for the shaft $1\frac{1}{2}$ by $1\frac{1}{2}$ by 50 in. and hand dress or, better still, plane it on a small jointer to the proper taper. Cut two pieces for the base 1 by $1\frac{1}{2}$ in. by 14 in. and make a cross lap joint; also chamfer the edges either by hand or on a shaper, if available. Then glue the two parts of the base together and clean them up when the glue has set.

The cut-outs of the puppies are used as braces. Copy the design on a piece of cardboard 6 by 6 in. after dividing it into $\frac{1}{2}$ -in. squares, and cut around the outline with scissors. Trace the cardboard outline of the four puppies on a $\frac{3}{4}$ in. thick board. Cut the wood with a coping saw or on a power scroll saw, keeping slightly outside the lines; then file to the lines, and sandpaper all parts with Nos. 1, $\frac{1}{2}$, and 0 sandpaper.

How the parts of the costumer are constructed and assembled



Prepare dowels $\frac{3}{16}$ by $1\frac{1}{2}$ in. and bore holes in the shaft and braces as indicated. Be careful that each brace and corresponding side of shaft are marked in the order in which they are to go together, and number all the parts.

Drill a hole in the bottom end of the shaft slightly smaller than the 2 by $\frac{1}{4}$ in. lag screw which is to hold shaft and base together. Drill two holes for $1\frac{1}{4}$ -in. No. 8 flathead wood screws in each of the four feet of the base and in the bottom edge of each puppy. Glue and screw the shaft and two braces together at one time and allow the glue to set. Then fasten the other two braces in place, taking care to keep them square with the shaft.

If the costumer is to be enameled or lacquered, apply one thin coat of white shellac, rub gently with No. 0 sandpaper, then apply the colors as indicated. Of course, other colors may be chosen to suit individual taste. Four coat and hat hooks are finally added in the positions indicated on the drawings.

CUT DOWN YOUR
RAZOR STROKES



Extra-moist lather breaks all records for easy shaves

...soaks beard soft—soothes skin

SHAVERS... Fore! Here's a new, extra-moist lather that soothes the skin—helps cut your razor strokes down to par—and breaks all records for cool, clean, snappy shaves.

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It's next to impossible to get a good shave with a light, fluffy, quick-drying lather. But Lifebuoy Shaving Cream brushes up double-quick to a big, rich, thirsty lather that soaks up water like a dried-out green and holds it.

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Laboratory tests show that Lifebuoy lather will hold 52% more moisture than ordinary lather. It stays moist from beginning to end of the shave. It drenches your whiskers—soaks them soft and limp. Your razor cuts through them with smooth, even strokes and never a sign of slice or pull.

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Try this shaving treat

Get the big red tube of Lifebuoy Shaving Cream at your druggist's today. Or write for a free trial tube to Lever Brothers Co., Dept. H-9, Cambridge, Mass.

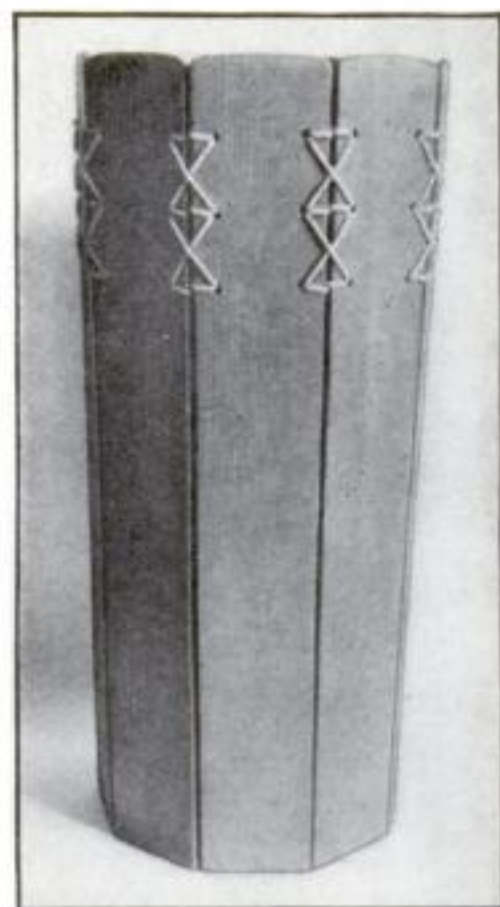
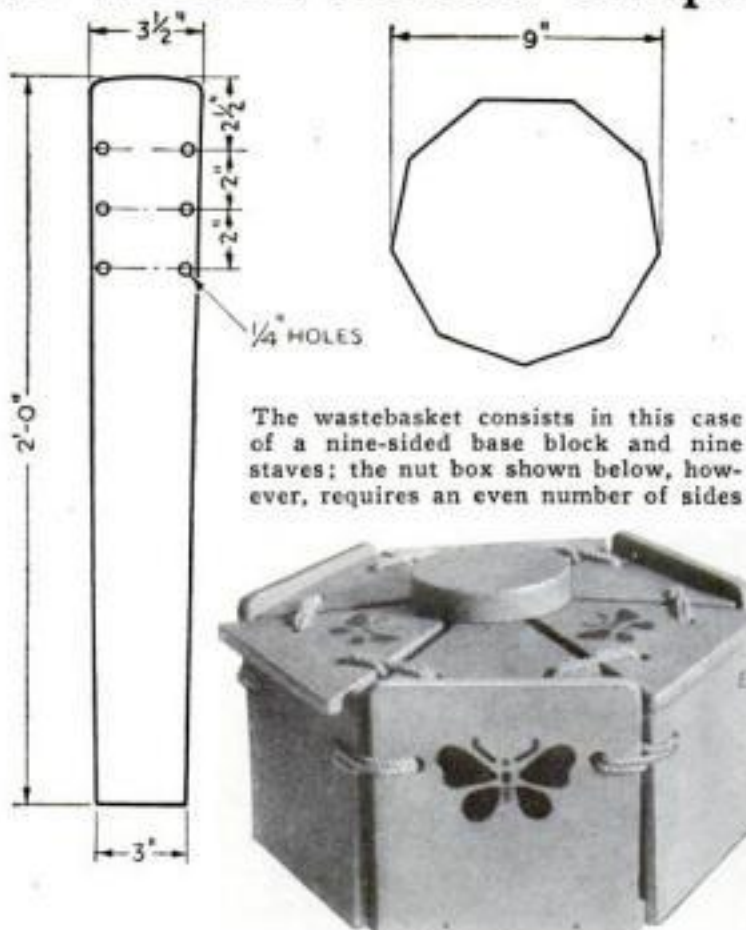


Laced Joints Give Wooden Boxes a Unique Appearance

AN ARTISTIC wooden wastebasket and an unusually novel nut box can be made with very little work as shown in the accompanying illustrations.

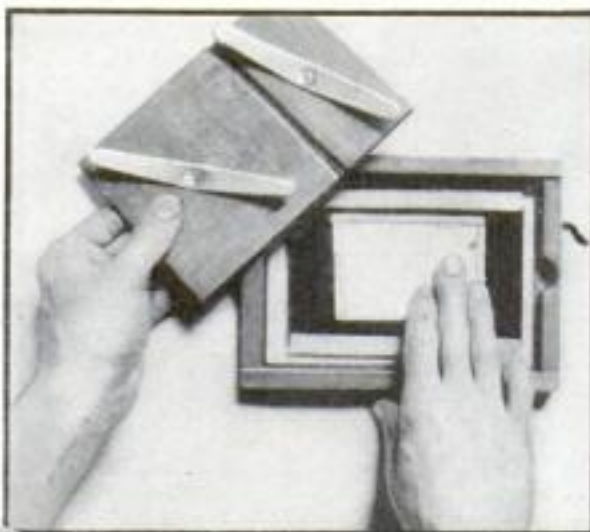
Out of a 1-in. board cut a polygon of any desired number of sides to form the base block of the wastebasket. Then cut panels to correspond from $\frac{1}{4}$ - or $\frac{3}{8}$ -in. boards. Drill holes at the top of each for the laces, and nail one of the panels to each side of the polygon. Finish the wood with stain, lacquer, or in any way desired. A design can be painted on each panel, if you wish, or decalcomania transfers applied. Then add the cotton laces, which may be dyed any color desired.

The small covered box is made like the wastebasket, but the polygon in this case must have an even number of sides. The cover is made of triangular pieces all alike except in respect to length. Half of them are long enough to project over the side of the box, the others fit within the box, and the cover therefore cannot slide out of place. A small knob on the top holds the points of the pieces together and forms a handle.—HUBERT KIDDER.



ADHESIVE TAPE FASTENS PHOTO MASK

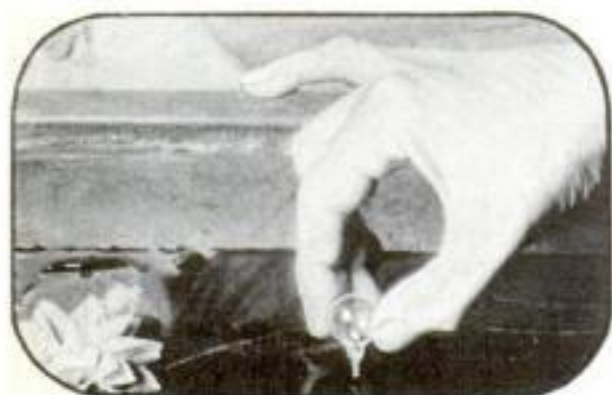
THERE is no danger that a photographic negative will accidentally be moved out of place when printing pictures if the mask is stuck securely to the glass of the printing frame with strips of adhesive tape as shown in the accompanying illustrations. The negative is slipped through under one end. Narrow guides of adhesive tape may also be stuck along an end and a side of the mask $\frac{1}{4}$ or $\frac{3}{16}$ in. from the opening; then, provided the correct size paper is used, no trimming will be necessary. Commercial masks made of a special red celluloid are ideal for this purpose.—L.C.



Two strips of adhesive tape applied along the longer edges of a mask fasten it to the printing-frame glass, and two other strips along an end and a side of the mask form guides for the paper

PHOTO PRINTS ROLLED DOWN WITH PENCIL

IN AN emergency, a large marking pencil will serve as a substitute for a photographic roller for mounting prints. Place the print accurately in position on the mount as illustrated in the accompanying photograph. Then lay the pencil across it at one end, rest the end of a ruler over the pencil, and roll the pencil over the print by sliding the ruler back and forth with enough pressure to insure perfectly smooth contact.—PETER P. ROCCAPRIORE.



GLASS BUBBLES SPARKLE IN GARDEN POOL

INTEREST is added to a garden pool or indoor aquarium if a few bubbles are floating about on the surface of the water. These bubbles are nothing more than burned-out automobile head lamps and dash lamps from which the bases have been removed. If the base is squeezed near the bulb end with a pair of pliers, the cement will usually crack. Then the base should be twisted until the wires to the filament break.—HERBERT WOOLSEY.

THE ordinary type of electric heater with polished copper reflector can be converted easily into a flood light for lighting a room indirectly by the simple expedient of removing the wire guard and screwing a 100- or 200-watt bulb into the socket to replace the heating element. When placed on a table and turned towards the wall or set on top of a bookcase, as shown in the larger illustration at the right, and turned towards the ceiling, it will light the whole room without glare. It furnishes ideal illumination for bridge players and is infinitely better than a floor lamp, as there is no reflected glare from the white cards.—J. K. TULLY.



With a lamp in it, the heater becomes an indirect lighting fixture



DOUBLE-DUTY DESK AND DRESSER MADE FROM AN OLD BUREAU

BY UTILIZING an old bureau, it is possible to construct a combination desk and dresser with less than a quarter of the work required in building a new desk. When the writing top is closed, the finished piece looks like a three-drawer Colonial lowboy, but with the top open it is a comfortable and commodious desk with generous provisions for writing materials.

Often a chest of drawers suitable for this purpose can be found among the cast-offs in the attic; if not, it is easy to



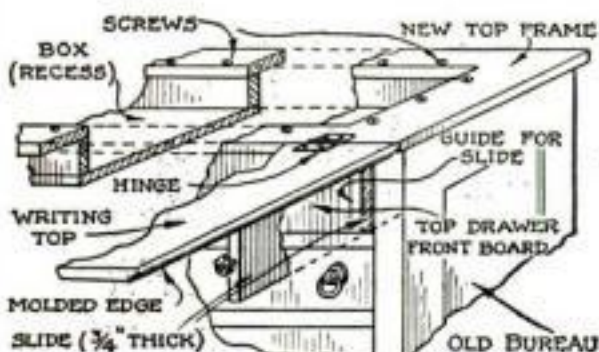
Opened, the piece becomes a neat desk with spacious compartments for your stationery.

obtain one at a secondhand furniture store for two or three dollars.

First, carefully remove the top and saw off one or more of the top drawer sections so that when cut down, the desk will stand about 30 in. high. Remove the finish with commercial paint remover, and sand the chest and drawer fronts thoroughly with No. 1 sandpaper.

Build on a new top frame with a rectangular opening approximately 14 by 24 in. and secure it firmly with wood screws and small metal angles placed underneath. Then, to serve as the desk compartment, construct a box having inside dimensions the same as the top opening. For the bottom of the box wall board or pressed wood may be used. Fasten the box in place with countersunk wood screws driven down through the top. The sunken compartment thus formed occupies the space of the upper drawer. It may be subdivided as desired to accommodate paper, envelopes, and other writing materials and accessories.

At each end of the top drawer open-



How the transformation is made. Notice new top frame and two slides to support the lid.

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NEW JIG SAW SOON

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What are electrons?
Is electricity a form of matter?
What is a crystal?
How large is the universe?
Why do the stars twinkle?
How do we know what the stars are made of?
Is the inside of the earth molten?
What is an electric spark?
What makes the noise of thunder?

ing in the front should be placed a piece of $\frac{3}{4}$ in. thick wood to serve as a guide for the wooden slides which are pulled out to support the lid when it is opened for writing. These slides move in and out in the old drawer runs. The space between the two guides is filled in with a board nailed in place down through the top frame and up through the drawer rail.

Two strong brass hinges are required for the writing top, which is the original top of the bureau. To fit them, pull out the slides and lay the top in the writing position $\frac{1}{16}$ in. back from the edge of the newly made top frame. Set the hinges in position and, holding them firmly in place, draw a line around them. With



With lid closed the desk becomes a three-drawer Colonial lowboy or dressing table.

chisel and knife, carefully cut out recesses for sinking the hinges flush with the surface of the wood so that the movable top will close down flat against the new rectangular top frame.

Be sure to place the hinges on the correct edge, as the front edge of the top usually is beveled, while the back edge is unfinished. The latter should be planed smooth as it will be visible when the desk is open.

After a final sanding, cover the countersunk screws with a ready-mixed wood paste, and paint, lacquer, or stain and varnish the piece as desired. Place the old drawer pulls back in position and also fasten a pair of them on the false front which was built in to replace the top drawer. Glue a strip of felt to the upper edge of each slide so that the top will not become scratched.—EVERETT EAMES.

SIMPLE PURITY TEST FOR TURPENTINE

THE presence of mineral oil in turpentine can be detected by mixing aniline oil, obtainable at large drug supply houses, with an equal part of the turpentine in question. Shake the two together and then allow the resulting liquid to stand for about five minutes. If the mixture remains uniform throughout, the turpentine is pure, but if two distinct layers appear it indicates that the turpentine contains a certain amount of mineral oil.

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KIT NO. 4

AS A SERVICE to readers who find it difficult to obtain suitable materials for building high-grade furniture and models, the Popular Science Homecraft Guild has assembled the kits listed below.

The numbered kits, which are also marked "ready to assemble," contain the completely machined wooden parts, the necessary hardware, and the Guild finishes. The other kits, identified by letters, contain the raw materials alone (without paints or finishes) and are for craftsmen who wish to do all the work themselves. All kits are accompanied by instructions or blueprints. Because of heavy shipping charges, the prices are 50 cents higher west of the Mississippi River.

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No. 2. Solid mahogany tray-top table 23 in. high with a 15 in. diameter top. Ready to assemble..... 5.90

No. 3. Tilt-top coffee table in selected maple with top 19 by 28 in., and 21 in. high. Ready to assemble..... 7.15

No. 3A. The same table in solid mahogany. Ready to assemble..... 8.15

No. 4. Solid mahogany book trough 22½ in. long, 9½ in. wide, and 24¾ in. high over all. Ready to assemble..... 5.30

A. Whaling ship model *Wanderer*. All the raw materials—wood, sheet brass, and copper, five sizes of wire, four sizes of fishing line, fine chain, celluloid, and everything but the paints, together with Blueprints Nos. 151, 152, 153, and 154..... 6.90

B. Folding muffin stand in selected sugar pine, 11 in. wide, 19 in. long and 33 in. high when open. All the necessary wood cut to



KIT NO. 2



KITS B AND C



KIT NO. 1



KIT A



KITS NOS. 3 AND 3A

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C. Muffin stand in birch (can be finished as maple, walnut, or mahogany)..... 2.90

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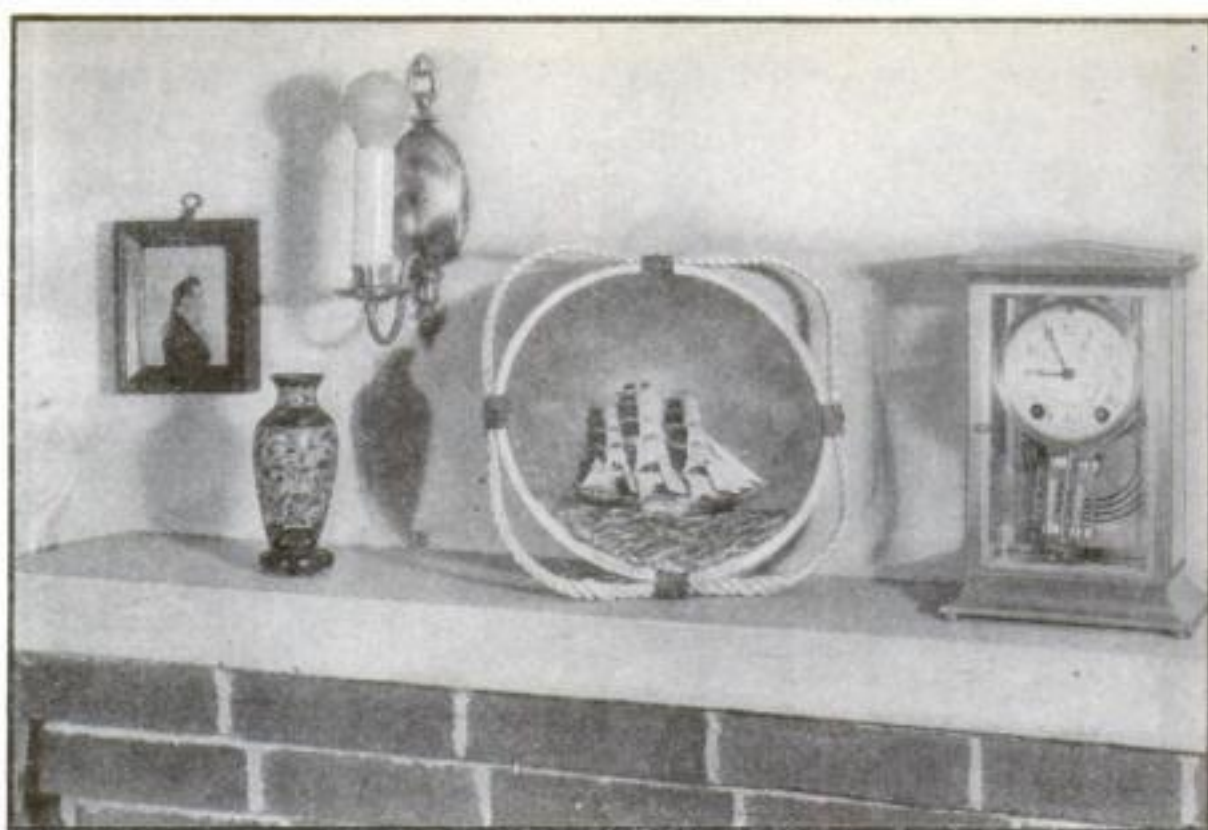
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CHOPPING BOWL forms base of this Ship Model Plaque

HERE is something new in ship model novelties—a miniature of your favorite ship sailing in a realistic setting of sea and sky, and so mounted that it can be placed on the mantel or hung on the wall.

Being small, this unique scenic model is easy to build. A sharp penknife and a hammer are the only tools required. The plaque illustrated is the handiwork of a veteran model maker, Charles V. Nielsen, of Hasbrouck Heights, N. J.

The spherical surface which forms the cyclorama for sea and sky is a 12 or 13 in. diameter wooden chopping bowl. These are obtainable at hardware and house furnishing stores. First, sandpaper the inside of the bowl smooth and give it a

coat of dark blue artists' oil color. This will form the base color for the sky.

Although any type of ship can be mounted in this way, a long slender clipper ship in full sail is probably the most decorative. The hull is whittled from a block of soft wood. Cut the top of the hull out to form the bulwarks and glue bits of shaped wood to the deck to represent the deck houses, lifeboats, and other deck fittings. Since the hull is to be embedded in the putty sea it is not necessary to fashion the complete hull; a depth of 1/4 in. below the water line will be sufficient. Paint and varnish the hull carefully. For a clipper ship, black with red below the water line gives a good effect.

The tiny masts can be



A photo taken at an angle to show how far the model stands out on the painted putty sea

12" OR 13" WOODEN MIXING BOWL



NAILS AND WIRE TO FORM BASE FOR PUTTY

WHEN MODEL HAS BEEN PLACED, SET PLAQUE AT AN ANGLE, UNTIL PUTTY HARDENS



SMALL BLOCK



CANVAS FASTENING; ENDS OF ROPE UNDER ONE FASTENING

A foundation for the putty is made as shown in the first sketch. The bowl is set as in the second drawing until the putty is hard; then the rope is fastened on as in the third view

made in one piece, small steps being cut in to simulate the joints between the lowermast, topmast, and topgallant mast. The masts are glued in holes in the deck. The yards and boom are nicely rounded sticks, tapering toward the ends. Black and white silk thread is used for the rigging, and window shade material or heavy paper for the sails.

Before placing the putty sea, drive half a dozen brads into the inside of the wooden bowl where the sea is to be so that their heads are lower than the plane of the bowl rim. Wind wire around these brads, looping it from one to the other, to form a reinforced base for the putty. The sea material is made by mixing colored pigments—green and lampblack—with ordinary putty. Mix enough of the pigments to obtain the right tint and to bring the putty to a stiff consistency. Place the putty bit by bit, working it in between the wires and nails. At the upper edge of the putty sea, shape an almost square shelf to accommodate the model.

When the putty has been built up flush with the rim of the bowl, the surface can be marked with the fingers and a knife blade or a pencil point to represent waves. After the model has been pushed into place, the putty should be pressed up tight against the sides of the hull.

While allowing the putty to harden, place the bowl at an angle so that there will be no tendency for the putty to slip out of the bowl. When hard, the putty is painted green, and the tips of the modeled waves are touched with a bit of white to simulate whitecaps. The sky can be touched up with white to represent clouds, and if desired, a coast line may be painted along the horizon. If much painting is to be done to the sky, it will be well to complete it before the model is set up.

To enhance the nautical effect of the plaque, a length of rope can be attached around the rim as shown. The rope and rim of the bowl are painted white and the rope fastenings, which are canvas, red.

If the plaque is to be hung on the wall, two screw eyes and a length of picture wire must be added to the back. To support it on the mantel, a suitable wire easel can be arranged on the back.

NEW WAY OF RETINNING A SOLDERING IRON

WHEN a hot or overheated soldering iron needs to be retinned and time cannot be spared to wait for it to cool for filing down or grinding the tip and for retinning in the usual manner, try this procedure: Choose an old, coarse file and rub one cutting face generously with soldering paste or flux. Then take bar or wire solder and rub vigorously over the paste until the file grooves are well filled with the solder. The paste will prevent any small particles of solder from falling off. File the hot soldering iron tip with the face of the file so treated, and a well-tinned tip will be the result. The reason this method is so successful is that solder and paste are both applied at the very point of contact of the file with the copper and at the same instant the old scale is being removed. Even on the hottest tips, the solder and paste will act before the new surface has had time to oxidize.—L. N. GOODMAN.

The Questions

1. Who was the mother of Solomon?
2. Is the whale a fish?
3. What is the literal meaning of malaria?
4. What are the five Great Lakes?
5. Who was Iris?
6. What is a catwalk?
7. When was Pompeii destroyed?
8. Of what word is spats an abbreviation?
9. In what common drink is tannic acid found?
10. What is an apiary?

The Answers

1. Bath-sheba.
2. No. It is a mammal.
3. Bad air. (Italian mala aria.)
4. Superior, Huron, Michigan, Erie, Ontario.
5. Goddess of the Rainbow in Greek mythology.
6. Footway along keel of a rigid airship.
7. A.D. 79.
8. Spatterdashies.
9. Tea.
10. A place where bees are kept.

How Many of These Questions Can You Answer?

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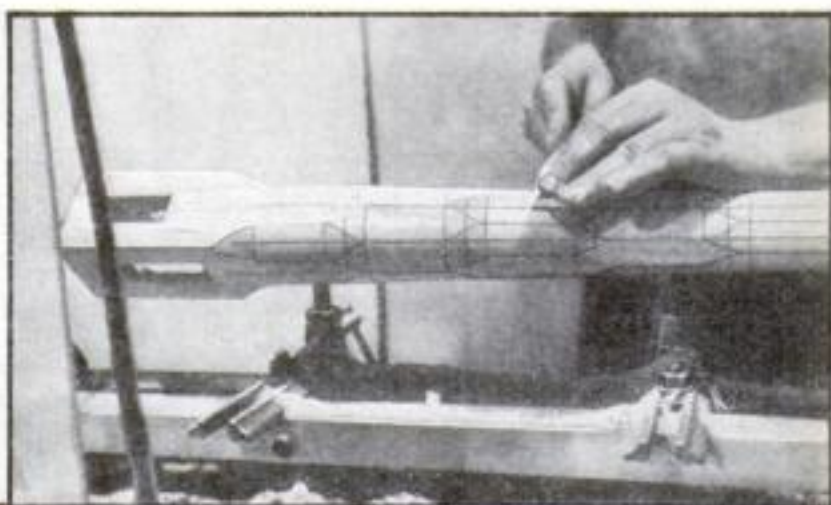
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CURIOUS PEDESTAL SUPPORTS STAND

(Continued from page 74)

with six countersunk screws from below.

Some form of water or acid stain is recommended in finishing as it brings out the grain more clearly than oil stain. This may be purchased already made up or in powder form. The so-called commercial "Early American" stain ranges from light tan to a reddish brown, according to the maker, and should be tried out on a spare piece of maple to see if it is the shade desired. Its application will raise the grain of the wood considerably, necessitating a light sanding to regain a smooth surface. Some of this final sanding, however, may be done before staining if the surface of the raw wood is first lightly sponged with clear water. After the wood is dry, rub off the raised fibers with fine sandpaper or No. 0 or finer steel wool.

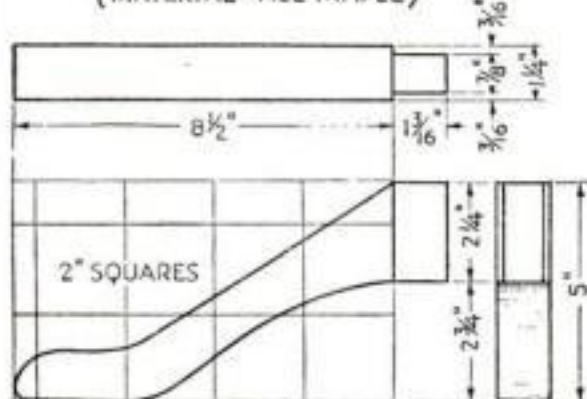


At left: How the turned pedestal is divided lengthwise into eight equal parts with the aid of a flexible straightedge. Above: Filing flats on the pedestal after the facet outlines have been drawn in. Below: The underside of the top, the bill of material, and detail drawings of the curved feet

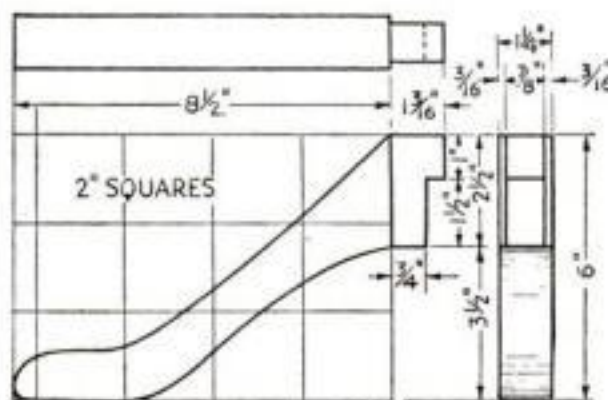
BILL OF MATERIAL

NO.	NAME	REQD.	SIZE
1	TOP	1	3/4" x 16" DIA.
2	CROSSPIECE	1	1 1/4" x 1 1/4" x 14"
3	PEDESTAL	1	2 1/2" x 2 1/2" x 2'-3 1/4"
4	HIGH FEET	2	1 1/4" STOCK
5	LOW FEET	2	1 1/4" STOCK

(MATERIAL—ALL MAPLE)



LOW FEET PART ⑤ (2 REQ'D)



HIGH FEET PART ④ (2 REQ'D)



coats of shellac, leveled off with very fine sandpaper between coats and the last coat rubbed with pumice and oil.

OILING OUTBOARD MOTOR

As ONE of the outboard pioneers in Seattle, Wash., I have had about every make of motor and find that the salt water of our inland sea plays havoc with them unless every inch is thoroughly oiled. I used to spend a lot of time going over the motors with an oily rag, but now I use a fifteen-cent garden spray gun filled with light motor oil. After running the engine in the fresh water tank a while, I spray the whole engine in a few seconds. I have never had the slightest trouble with "frozen" nuts or bolts since I thought of this method.—L. ALLEN.

WHEN large quantities of liquids have to be filtered, it is possible to save time by spacing four wood applicators (sticks about 8 in. long which can be obtained from the drug store) between the filtering paper and the funnel.—K. M.

SHUT ONE EYE BEFORE YOU TAKE A PHOTO

(Continued from page 69)

formation. A scene that ordinarily would not produce a photograph worth a passing glance becomes quite appealing to the eye when clouds are added.

The left-hand picture at the bottom of page 69 shows a scene nobody would bother to look at twice. The right-hand photograph is exactly the same view taken with a yellow filter in front of the lens on a day when there were plenty of clouds in the sky.

In many cases, especially when traveling, you must either snap a picture of the scene when you have the opportunity or else pass up the chance for a photograph. However, if it is possible to do so, go after pictures of this type—that is, most long-range outdoor scenes—when there are some clouds. Note also that the cloud formation is constantly changing, and it usually pays to wait, if the clouds are not well arranged when you first arrive at the scene, till the formation is more striking.

Although to the casual glance clouds seem to move slowly, you will rarely have to wait more than a quarter hour or so for the effect you want. The most effective clouds for photographic purposes are the white cotton-like variety floating against a clear, blue sky.

Two types of yellow filters are available. One, the so-called "sky-filter," is made with the yellow color extending only part way across the circle of glass. It is placed over the lens with the yellow side uppermost. The idea is to have the yellow portion absorb more of the light from the sky than from the foreground and thereby register the cloud effect without unduly prolonging the total exposure.

The plain yellow filters come in three grades; light, medium, and dark. Any yellow filter makes a longer exposure necessary. The amount of increase depends on the type of plate or film and on the strength of the filter. For verichrome film, the ordinary light yellow filter increases the exposure about twice, the medium filter from three to five times, and the dark filter from five to ten times. Super-sensitive panchromatic or the new portrait panchromatic film require only twice the exposure when using the average dark yellow filter.

Another photographic article will appear next month. Any questions you may wish to ask about photographic problems should be addressed to Mr. Ryder in care of this magazine. Inclose a self-addressed, stamped envelope for his reply.

Photo Contest AWARDS

The \$10 prize for the best photograph entered in our twelfth photographic contest (P. S. M., May '32, p. 112), which was on the subject of room interiors, has been awarded to A. H. Parsons, Burlingame, Calif. The following won honorable mention in the same contest: Harrison Bickford, St. Johnsbury, Vt.; George Carlson, Chicago, Ill.; Tom Griberg, Moline, Ill.; Charles Hupner, Oakland, Calif.; L. D. Moorhead, Sandy Springs, S. C.; C. C. Palmer, College Station, Texas; J. R. Parker, Hartford, Conn.; Irving Rudin, Brooklyn, N. Y.; Lloyd B. Schlag, Newton, Kans.; S. H. Smith, Atlanta, Ga.; S. A. Switzer, Oxford, Ohio; Mrs. Z. W. Watts, Newton Centre, Mass.; L. W. Werner, Atlanta, Ga. The winner of the June contest will be announced next month.

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TAKE MILLIONS FROM SEA

(Continued from page 8)

Greek tramp; later, that of a Spanish orange boat. In each case, divers went down and satisfied themselves that the wreck was not the *Egypt*. As in the previous year, a long spell of storms in July halted operations.

ONE day, toward the end of August, the *Artiglio* returned to a spot the salvagers had picked as the most likely in which to find the *Egypt*. Five buoys, anchored to one-ton weights, had been laid in an even line to mark it. Reaching the place in the afternoon, Chief Salvage Officer Gianni found the most easterly of the buoys was gone. He was about to give orders to replace it, when he spotted it half a mile away.

Ranging the *Artiglio* alongside the wandering buoy, Gianni made a tackle fast to it and signaled for the winch to start pulling. The buoy rose ten feet above the water and stuck. Its taut steel wire was fast to something on the bottom. Finally, the obstacle gave way. With the tangled mooring wire and the one-ton weight, a long, curved arm of rusty steel came to the surface. It was a davit, a small curved crane used for dropping anchor.

Gianni and his assistants rushed below, with trembling hands unfolded the *Egypt's* plans, scaled off the davit's measurements. They fitted to a fraction of an inch. The wreck must be the *Egypt*.

The next morning, August 29, Chief Diver Bargellini, in the eye, went over the side. Gianni, the *Egypt's* blueprints before him, held the *Artiglio* end of the telephone wire. In the dim light 400 feet below, Bargellini, for a full hour, inspected the wreck, described it, feature by feature, detail by detail, to Gianni.

"Enough!" Gianni finally told him. "It's the *Egypt*."

From then on, a man, in the bottle, was constantly on the bottom, directing, by telephone, operations by winch, boom, and cable, of enormous grappling irons, and the placement of a high-explosive charge that tore the roof off the captain's cabin. In it stood a safe that must contain the key to the steel strong-room in which the treasure was stored.

By means of powerful scissors grabs, the safe was raised. Triumphant, the *Artiglio* steamed into Brest harbor. There the rusty safe was opened. It contained papers, maps, charts, but no keys.

Gianni then decided to cut out the bullion room—a narrow chamber twenty-five feet long, eight feet wide, and nine feet high—and lift it bodily to the surface.

Delighted with this daring scheme, the divers set to work. They had blown off the deck houses and part of the boat deck above the treasure room with bombs, when, by the end of September, autumn gales drove them to port.

IN OCTOBER, the *Artiglio* was sent to remove the wreck of the steamer *Florence* which, sunk in war-time with a load of munitions between Quiberon, on the French coast, and Belle Ile, endangered navigation in the Bay of Biscay.

Her divers set three mines in the wreck's hold. When the munitions cargo exploded, the *Artiglio* was blown to bits. Gianni, Bargellini, and twelve other men were killed. The *Sorima* then dispatched another ship, the *Raffio*, to the scene to finish the job. In the course of lowering an eighteen-ton block of concrete, the *Raffio* was overturned with the loss of one more man.

These tragedies failed to kill Commander

Quaglia's determination to raise the *Egypt's* gold. In May of last year, he fitted out the *Artiglio II* in which the surviving expert divers, reinforced, sailed for Brittany. Bad weather set in the moment they arrived. It took them three days to relocate the *Egypt*, though Gianni had marked the wreck's position with buoys.

Immediately they resumed blasting. For weeks, months, they kept up a constant bombardment. There were days when they fired as many as fifty bombs—nearly half a ton of high explosives—at the derelict *Egypt*. They smashed massive plating; wrenched away steel deck-beams. By July, they had torn off two of the decks. Time and again, storms drove them off, but one day in November, they blew the third deck into fragments and the bullion room lay bare.

That night, a gale forced the *Artiglio II* to run to cover. With the treasure practically in their grasp, the salvagers for the third time had to bow to the elements. They stopped operations for the winter.

IN APRIL of this year, they were back on the job. They found the continuous blasting of last fall had damaged the strong-room to such an extent that it was impossible to carry out Gianni's plan to raise it in its entirety. They decided to lift the treasure with grabs.

Once more, they battled spring storms and tides. But on June 10, they reaped the first fruits of three years' labor when they brought up bundles of water-soaked banknotes to a face value of about \$14,000,000, printed in London for one of the native states of India. The issue had been cancelled, but the salvagers knew they were on the treasure's track at last.

Twelve days later, the first golden ingots plumped from one of the grabs on the *Artiglio's* deck.

That day, a million in gold bullion and coin was raised, and more than that between six and eight o'clock the next morning. After that, each shot of the grab yielded treasure of an average value of \$18,000—and there were about six shots an hour!

The salvagers will benefit handsomely from their persistent work. They undertook the job on the "no cure, no pay" basis; that is, they were not to profit at all in case of failure, but to receive fifty-seven percent of all they retrieved. However, there are complications. A French fisheries company, one of whose ships took part in an early attempt to locate the *Egypt*, has laid claim to part of the treasure. Meanwhile, the first million in gold was safely locked up in the vaults of a London bank.

THE biggest haul ever made in under-sea salvage was the recovery of \$35,000,000 in gold from the *Laurentic*, sunk off the Irish coast by a German submarine in 1917. The *Laurentic*, however, sank in only ninety feet of water.

The *Sorima's* Italian divers made their first appearance in the Atlantic in the summer of 1928, when they attempted to retrieve \$500,000 worth of diamonds and several tons of ivory tusks from the wreck of the *Elizabethville*, a Belgian steamer torpedoed by a German submarine near Belle Ile in 1917. The diamonds never were found, but some of the ivory was salvaged.

The following summer, they turned their attention to the *Egypt*, the recovery of whose treasure at a depth of 400 feet is sure to go down in marine history as the most spectacular feat in ocean salvage accomplished in our days.

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HOW TO KEEP YOUR CAR LOOKING NEW

(Continued from page 56)

you need the light in order to work by." "By George!" exclaimed Whitey. "That explains why the right front mudguard on every car I've owned always gets shabby looking before the rest of the car. There's a window in my garage at home right opposite that mudguard."

"Put a black shade over it," Gus advised. "Now to get back to this outdoor storage problem: Instead of washing your car every few days, give it one thorough wash and then polish it with wax type auto polish. The wax forms a protective coating over the lacquer and to some extent saves it from the sun. Also it make the body easy to clean because dust doesn't stick to the wax and a gentle wipe with a rag every few days will keep it looking fine. Of course you can't expect the wax to last forever, so give it another treatment before it begins to wear away."

"IF THE car is going to be outdoors all the time, it's a good idea to go over the bright work and the running gear with a slightly oily rag every so often. That's not so easy for the brake rods and the parts underneath that are hard to get at. For those places, give 'em a wipe once in a while with a rag smeared with a bit of gun grease. That will protect them for a long time although it will pick up plenty of dust."

"What do you do about road tar?" Whitey asked. "You can't get that off with body polish."

"Use kerosene on a rag with gentle rubbing," Gus advised, "and get at it as soon as possible, the same day you pick up the tar if you can. If you let it set for a week or two it's much harder to remove. Don't scrape it off the underside of the mudguards, either. If you do, you are sure to scratch the enamel and in time rust will eat holes through the sheet steel."

"So that's it, eh," Whitey commented. "And would that keep a car in good shape at the seashore?"

"Listen, mister," Gus grunted, "if you ever dope out any way to keep a car looking like new when you keep it outdoors within a few hundred feet of salt water, then believe me, old-timer, I'll take off my hat to you!"

ROADS BUILT OF GLASS FOR AUTO TRAFFIC

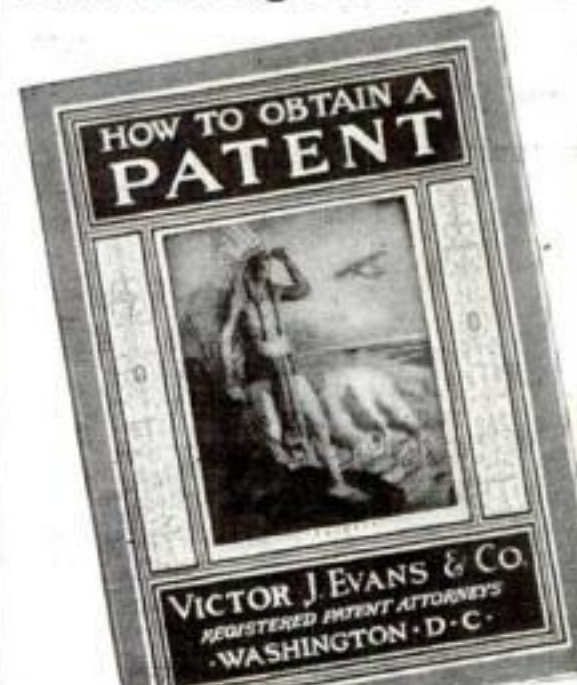
ROADS of glass are being built for motor traffic in Czechoslovakia. Two experimental stretches of highway, constructed by spreading a mixture of glass powder and cement on a damp concrete base and then saturating it with water glass, have been under test for several months. The results are said to show the new type of road is superior in withstanding wear and pressure. In addition, the glass and concrete mixture sets so rapidly that it is reported a highway can be opened to heavy traffic within two or three days after it is laid.

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NEW RADIO SETS HIT HIGH MARK

(Continued from page 53)

that will produce a proper balance is a delicate and difficult job. In fact a poorly designed two-speaker job may be distinctly inferior to a correctly designed single-speaker receiver. The Popular Science Institute can help you avoid radio receivers that are below par because of poor speaker or circuit design.

In the past, tremendous volume could only be obtained by using expensive tubes such as the type 250 in elaborate and costly circuits. Now, with the aid of the remarkable new type 46 power tube, the latest sets will give you more volume than you can use, yet the tone quality will not be sacrificed.

The basic theory of "push-push" amplification was given last month. Although the actual operation of the tube is radically different from the old push-pull system, the new push-push circuit looks like the old one.

Checking over the new circuit, lower left of page 53, you will see that virtually the only important differences are in the type of transformer used to couple the first audio stage to the push-push output stage and in the biasing of the type 46 tubes.

In the old push-pull circuit, upper right, the power tubes were voltage operated devices. In other words, they produced signals in accordance with the changes in the voltage applied to their grids by the secondary of the input push-pull transformer. The flow of plate current through biasing resistance R developed a relatively high C voltage which kept the control grid strongly negative with respect to the heated cathode. The circuit was largely self-adjusting because an increased plate voltage with the resulting increased flow of plate current immediately resulted in an increased C bias.

In a circuit of this type, the signal voltage impressed on the grids has the effect of making them momentarily more or less negative. The steadily flowing plate current is therefore affected in the same manner.

In the new push-push circuit, there is no biasing resistance. The double grid is operated virtually at zero potential, yet because of its construction, the steady flow of plate current is only a few milliamperes.

It is obvious that any change in the grid voltage tending to reduce the flow of plate current would have virtually no effect. On the other hand, a change of the grid to a positive voltage, during that half of the electrical tone wave cycle, would greatly increase the plate current flow.

The difference in the manner in which the circuit functions calls for a corresponding change in the electrical characteristics of the parts. In the ordinary push-pull circuit, the input transformer is a voltage operated device. Only a trifling amount of current actually flows in the secondary winding. In the push-push arrangement, there is a definite flow of current during the half of the cycle when the tube is operating. To handle this situation, the input transformer is made step-down instead of step-up.

This change in the input push-push transformer explains why the extra audio stage is needed in the push-push hook-up. It makes up for the voltage necessarily lost in the step-down arrangement. Furthermore, the type 46 tube is used in this extra stage. The change in the connection of the extra grid converts it to a straight power tube. Its power handling ability is needed to operate the input push-push transformer.

SNARE NOTES OF WILD BIRDS

(Continued from page 17)

recording wild life sounds is the first method developed to gather such information. The case of the common barnyard hen strikingly illustrates the range of bird calls. She uses one call to summon chicks that have strayed. Another serves as warning, while a third tells the chicks that food has been found.

Part of the bird language is universal; that is to say, a few of the calls are understood not only by members of one particular bird family, but by all birds. This is true especially of danger signals. In one of his first tests near Ithaca, Brand used a stuffed owl, which he placed in a woodland clearing as a decoy. He imitated the cry of a wounded young bird. Immediately, flocks of chickadees, tree sparrows, and other song birds rushed to the scene in mass formation. The moment they saw the dummy owl, they flew toward it and viciously pecked away at the intruder, sounding their calls of combat. These, Brand noted, were virtually identical regardless of species.

One of the many difficulties in bird song recording is the amazing talent of some varieties for imitating the songs of others. The mocking bird, of course, heads the list of mimics, but it has close rivals in the brown thrasher, several types of starlings, and a number of European birds.

Extraneous sounds—running water, the wind in the trees, the rustle of dead leaves, the droning of an airplane, and the purring of automobile engines, have ruined many of Brand's records. No wonder that, of the 17,000 feet of film taken, 4,000 feet were worthless.

But the balance includes the clearly distinguishable songs of the pied-billed grebe, whip-poor-will, northern flicker, alder flycatcher, wood pewee, black-capped chickadee, white-breasted nuthatch, house wren, robin, wood

thrush, hermit thrush, olive-backed thrush, veery, yellow-throated vireo, red-eyed vireo, yellow warbler, magnolia warbler, chestnut-sided warbler, ovenbird, northern water thrush, Canada warbler, bobolink, eastern meadow-lark, red-winged blackbird, scarlet tanager, indigo bunting, Savannah sparrow, Henslow sparrow, vesper sparrow, chipping sparrow, field sparrow, white-throated sparrow, song sparrow—forty-one in all.

The realistic effect of the phonograph records made from these sound films, especially when heard in the open, is astonishing. Not long ago, a professor of the Cornell bird department and his wife spent a week-end at their woodland cabin near Ithaca. One morning, they heard the melodious notes of a wood thrush and tried to locate the singer. They were amazed when the "sound trail" led to the neighboring cottage of Brand, who was playing a record on his porch.

In his song hunts, Brand uses a condenser microphone such as employed in radio broadcasting and talkie studios, 250 feet of weather-proof cable, a sound camera and amplifying apparatus similar to those used by the news talkie men but modified for his purpose, and a machine to "play back" his sound film after development. The apparatus is housed in a specially built truck.

Brand and his assistant now are working to perfect a special parabolic disk of papier-mâché to serve as a sound reflector in taking bird talkies. Built around the microphone, the disk, measuring three feet in diameter and shaped like a huge automobile headlight, will provide a large surface for the reception of sound, permitting the successful operation of the amplifying equipment at greater distance from the song perches than is now possible.

This One



WQ54-RFQ-CL56

STRICT SCHOOL FOR WAR BIRDS

(Continued from page 35)

When Charles A. Lindbergh enrolled as a cadet at Brooks Field, the forerunner of Randolph, he arrived in a moth-eaten Canadian "Jenny" biplane with part of the fabric gone from one wing. He had ridden it down from Missouri instead of coming by train. According to the story, the commanding officer took one look at the dilapidated crate and ordered him to get it off the field!

Lindbergh had 325 hours in the air when he applied for Army training. In one recent class, four men who held transport licenses failed to make the grade and were "washed out" before the end of the course. The fifty hard-boiled, efficient instructors at Randolph have learned that a man may make a crack commercial pilot and fail as an Army flyer.

The eight months' work at Randolph Field is divided into two stages of four months each. During the first period, students fly sturdy, relatively slow training ships; during the second, faster machines. Less than fifty percent of the men who start in at Randolph survive the two stages and finish at Kelly Field, the advanced school a few miles distant where Lindbergh and other noted pilots received their coveted "wings," the emblem of an Air Corps flyer.

FROM five A.M. reveille onward, the exciting days are packed with activity for the rookie airmen. Clad in mechanics' overalls instead of their distinctive light blue uniforms, the cadets tear down and reassemble engines and machine guns, swing compasses, align propellers, pack parachutes, rig airplanes. After being whirled in a revolving chair, they peer at the dials in an "Ocker Box," learning to trust instruments rather than body sensations in blind flying. Perched on platforms above an immense rolling map, they practice dropping imaginary bombs and spotting hidden troops. In addition, there are courses in the theory of flight, meteorology, navigation, photography, and seventy hours of buzzer practice in aircraft radio.

Actual flying usually begins the latter part of the first week, the cadets being divided into groups of five with an instructor over each group. Flying is done in the morning; ground school work in the afternoon. Soon after daylight, the air is filled with the roar of more than a hundred motors as the orange-winged fleet takes to the sky. Two hundred and seventy-five planes are housed in the great hangars with their striking black-and-chrome-yellow checkerboard roofs. During flying hours, the neighborhood near San Antonio is probably more thickly populated with aircraft than any other similar space in the world.

ONE curious result is that the cattle in the fields have become so accustomed to the planes that they hardly notice them. It is literally true that they pay more attention to a fly than an airplane. Even when a machine sits down in an emergency landing, the cattle refuse to budge. It is the pilot who has to look out.

Not long ago, one of the Kelly Field cadets, practicing in a pursuit ship, was forced down with a broken piston forty miles from home. Cattle dotted every field below but one, a small triangular patch of cotton. Rather than risk cracking up on a cow, he headed for the little field, side-slipped in, and stopped just short of a barbed-wire fence. The next day, when the engine was fixed, he found the field was too small to start from and had to tear down the fence and start from a neighboring roadway.

In spite of the swarming planes at Randolph Field, collisions are few. Usually, when a rookie comes in after his first few solos and sees the air filled with wheeling Army planes,

he circles about at a safe distance getting up nerve to land. One fledgeling, in the early days, flew around for an hour and a quarter before he could decide to come down. Such a performance is known as a "biscuit-gun landing." It gets its name from the legendary gun supposed to have been invented by an Army instructor to shoot up biscuits and keep beginners alive while they made up their minds to land.

To keep the planes separated as much as possible, an imaginary line bisects Randolph Field and extends indefinitely. The "A stage" planes take off and fly to one side of the line; the "B stage" ships to the other. The territory is further divided so each group heads off in a predetermined direction and often an instructor will have a practice field of his own fifteen or twenty miles away where his students make their instruction and solo hops.

AT KELLY Field training school, the four-month course is devoted to specialized flying. There are four kinds of war birds—the pursuit, observation, bombardment and attack pilots. Students are placed in the branch of the air service for which they are best fitted. Flying goes on practically all day and there is relatively little ground school. The Kelly Field classrooms are in the sky. In wasplike planes, the pursuit pilots twist and dive in sham battles high in the air. Bombardment planes lumber along in raids beyond "the lines." Observation ships search for hidden "batteries" while attack machines streak low above the ground at three miles a minute raking imaginary trenches with machine-gun fire.

One of the stories that has a permanent place in the lore of Kelly Field concerns a Southern pilot called "Blackie," who decided that attack work was his special field of activity. On solos, he used to chase jack rabbits across the prairie, dive and bowl them over by dipping a wing tip as he shot past. It took hair-trigger piloting and he tried it once too often. A slight downgust caught his tilted plane, the low wing dug into a mesquite bush, and the ship rolled like a cartwheel until it folded up. Blackie crawled out undamaged but another dizzy escapade, a week later, "washed him out."

AT THAT time, one student in each group soloed the ship out to a small practice field while the rest rode out in a truck. After all had had a turn flying the plane, another student took it back and the others bumped home along the dusty roads. On this day, Blackie spied one of the trucks rumbling along heading back to the field. With engine on full, he dove and leveled out so close to the machine that his propeller slipstream flapped the canvas top. Then he pulled up in a rocketing wing-over and prepared to dive again, intending to give the rookies inside the scare of their lives. But he never finished that second dive. Halfway down, he saw pouring out of the machine, not the rookies he expected, but a truckload of generals!

The work at Randolph Field covers 500 hours of ground school and flying time; that at Kelly Field 137 hours of specialized training. Later in the course, cross-country flights are made to Galveston, on the Gulf of Mexico and Brownsville, on the Rio Grande. Before the pilots leave Kelly Field, they switch around, making flights in all four types of planes for added training. A graduate from Kelly is given his coveted "wings" and commissioned a second lieutenant in the U. S. Army Air Corps Reserve with the rating of pilot.

America's fighting flyers now number more than 1,200, its war planes more than 1,400, and the distance covered by Army flyers last year totaled 44,000,000 miles.

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WORK MIRACLES WITH ELECTRIC HOTBEDS

(Continued from page 21)

plants in less than three months, using a heater unit below the bed. The plants were of salable size three weeks earlier than those in manure hotbeds. Cabbage plants grown in electric beds were transplanted in eighteen days while those in manure beds were much smaller, and those in cold-frames were just peeping through the soil.

An Oregon florist roots ninety-five percent of his plants in fifteen days, whereas he succeeded in rooting only forty percent in three months by former methods. Another flower grower found that ninety-five to ninety-eight percent of his double petunias rooted in electric beds, in comparison with almost total failure by other methods. Geranium cuttings developed a root system three inches in diameter in eighteen days, compared to a month formerly required.

ELECTRIC hotbeds are practical no matter how low the outdoor temperature. At a point 100 miles north of the Arctic Circle, in Sweden, is a 3,000-square-foot bed that is used for growing spinach, lettuce, dill, radishes, cauliflower, parsley, and cucumbers. Near Stockholm is another hotbed covering 14,000 square feet.

The advantages of an electrically heated hotbed include the following:

1. From twenty to thirty percent less time is required for germinating seeds, rooting cuttings, and growing plants.
2. Plants are of superior quality.
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4. Heat can be turned off, converting the hotbed into a cold-frame.
5. The entire bed does not have to be rebuilt every year—topsoil can be changed without disturbing heating equipment.
6. Hotbeds can be used for fall plantings, when increased heat is needed at end of growing period.
7. Electricity is cheaper than manure in many localities, manure running as high as \$2.00 to \$4.00 for a six-by-six-foot bed, while electricity, at three cents per kilowatt-hour, will run from \$2.40 to \$12 a season. Manure lasts six weeks or less, while electricity is effective throughout the year.
8. Electricity does not introduce disease to the soil, and gives off no odor.

THE electric hotbed offers possibilities to almost anyone, whether in the plant-growing business or not. The home owner who likes to have fresh vegetables when winter winds are blowing snow into drifts can operate a little "two-sash" six-by-six-foot hotbed for two dollars or less a month. When spring is near, he can plant tomatoes, peppers, cabbage, and perhaps flower seed, and obtain plants that will be the envy of all gardeners in the neighborhood—except those who also have electric hotbeds.

The National Rural Electric Project, which has been studying the problem of plant heating, lists the following temperatures, which were suggested by one investigator:

Celery, fifty-seven to seventy-five degrees Fahrenheit; lettuce, fifty-nine to sixty-eight; cauliflower, fifty to sixty-eight; peas, fifty to sixty-eight; tomatoes, sixty-three to seventy-five; parsley, fifty-seven to seventy-two; radishes, fifty to fifty-nine; and cucumbers, seventy-two to eighty-two. Temperature of air in hotbeds can fluctuate. In fact, some seeds require it; but growing plants, particularly roots, should be kept fairly uniform. Cold-frame temperature should be regulated from thirty-five to thirty-nine degrees. Customary methods are followed in watering and ventilating beds, except that some growers provide too much ventilation.

Write to the heads of the institutions, and catalogs will be sent. If further information is needed to help you solve the Educational problems of a boy or girl

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